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ORIGINAL MEMOIRS.

A STUDY OF BURNS INVOLVING THE PERIOSTEUM OF THE VAULT OF THE SKULL.

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AND

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WE have recently had the opportunity of treating, at the same time, two cases of extensive burns of the vault of the skull, destroying the periosteum over large areas of the parietal, occipital and frontal bones.

Both cases were treated on the expectant plan; that is to say, the burns were treated antiseptically and we waited for the denuded bone plates to be cast off.

In one case this occurred without accident or complication, and final healing resulted. In the other, the patient progressed satisfactorily for a month, when he suddenly developed hemiplegia, aphasia, and coma, and died from a large brain abscess.

A consideration of these cases, with autopsy notes on the fatal case, and examination of the exfoliated occipital and frontal bones from the other case, teaches us the pathological process which will result from destruction of the periosteal covering of the cranium.

CASE I.—T. R., black male, aged about 25, was admitted to

St. Vincent's Hospital August 22, 1907, suffering from electric burns of right hand and forearm, requiring amputation, several slighter burns about the face and body and a burn over the left parietal bone extending down to the periosteum.

After amputation of the forearm, the burns were dressed antiseptically. In a few days the burn on the skull had cleaned off, leaving the parietal bone exposed over an area of about three inches, the centre of which was near the parietal eminence.

While his other wounds were in process of healing, the patient had a little fever, after which his temperature remained under 99, and his general condition was good, until September 19, when he had a sudden rise of temperature accompanied by hemiplegia, and quickly followed by stupor and death on September 23, 1907.

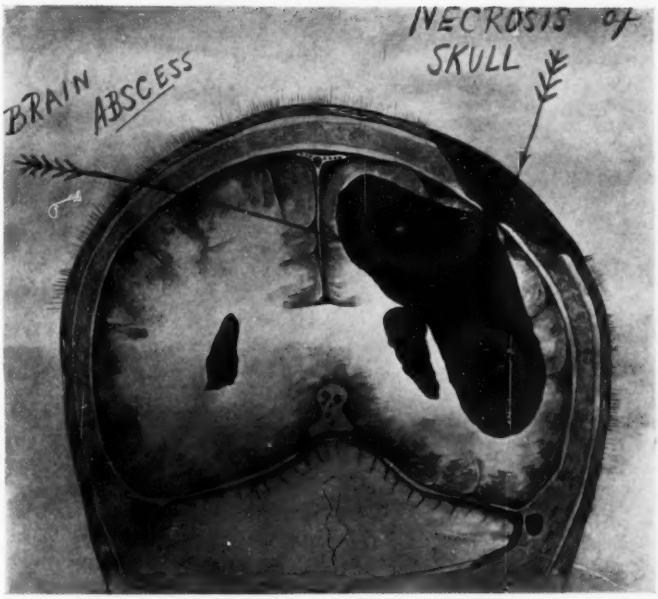
An autopsy was secured, with the following findings: The outer table of the parietal bone was necrosed over the area of the original burn, but was not detached from the surrounding bone. The inner table under the centre of the burn of the outer table showed a circular area of osteitis concentric with the outer table but less than half the diameter of the outer dead layer. This had not separated from the healthy bone around it.

Opposite the centre of this circle, where it was in contact with the dura, there appeared upon the dura a circular suppurating spot about the size of a five-cent piece. On the under surface of the dura opposite the centre of this spot was a very much smaller suppurating focus, and where this came in contact with the brain was a minute point showing where the infection reached the surface of the brain. Immediately beneath this, in the tissues of the brain, was located an enormous abscess, destroying a large part of the left hemisphere (Fig. 1).

The necrosis and infection had traveled downward and inward toward a point corresponding to the centre of the original circular burn of the parietal bone, each layer of tissue showing an area of infection and necrosis smaller than the one above it, until, at the point of contact with the brain, only a minute spot of infection was apparent. As soon, however, as the brain tissue was invaded, the infection traveled with great rapidity, quickly destroying nearly half the cerebrum.

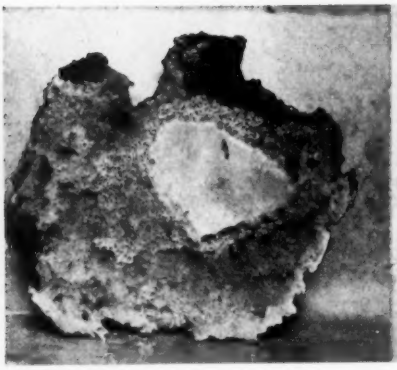
Case II.—T. S., colored male, aged about 25, was admitted to St. Vincent's Hospital, September 8, 1907, suffering from an electric burn three inches in diameter over the middle of the frontal bone, and another several inches long extending from the

FIG. 1.



CASE I.—Cross section of head (diagrammatic), showing mode of infection of brain from necrosis of skull.

FIG. 2.



CASE II.—Occipital sequestrum. Inner surface.

FIG. 3.

Outer surface.

FIG. 4.

CASE II.—Frontal sequestrum. Inner surface.

FIG. 5.

Outer surface.

FIG. 6.

CASE II.—Frontal cicatrix.

FIG. 7.

CASE II.—Occipital cicatrix.

upper part of the occipital bone well down on the neck. Both these burns charred the tissues down to the bones of the skull. There was also a third degree burn, several inches in diameter, over the left side of the chest.

The injuries were dressed antiseptically, and in a few days the burns on the head had cleaned off to the skull. The other burns were treated antiseptically until they had granulated sufficiently, when they were successfully grafted by Dr. Lester. We decided to pursue a waiting policy in dealing with the burns of the periosteum. While awaiting for separation of the sequestra, the rims of scalp around the borders of the burns were successfully grafted.

There was no tenderness under the area of exposed bone, and the patient ran a normal temperature. He remained in the hospital until October 31, and came back for dressings twice a week until December 20. We then lost sight of him until January 7, 1908, when we found the exposed bones loosened sufficiently to be lifted off (Figs. 2, 3, 4 and 5).

Near the centre of each exfoliated plate, the sequestration extended down through the internal table, and on removing the bone, the dura under these places was left bare.

The inner table was intact except for these central exfoliations.

These wounds were now dressed until the granulations were clean, and were then successfully grafted on January 22, 1908.

The head now presents a large cicatrix over the frontal bone and a similar one over the occipital bone. The brain is protected by the dura and by the inner table of the skull except near the centre of each cicatrix, where there is no bony layer. These layers are not much larger than half an inch in diameter, however, and are of no more seriousness than the opening left by a trephine of this size (Figs. 6 and 7).

The flat bones which form the vault of the skull are richly supplied with arterial blood through vessels which enter the outer table through the periosteum, and which enter the inner table through the endosteal layer of the dura. Larger nutrient arteries also enter the bones at different points.

The diploë lies between the outer and inner tables, and the interspaces are filled with channels for venous blood which finally leave the skull through various foramina at the base.

Anatomists differ concerning the presence of lymphatics in the dura or in the brain, so it is uncertain whether infection travels from bone to brain by this route.

If the inner table were as well supplied with blood as is the outer table, it is probable that, with destruction of periosteum, there would only be a loss of the corresponding outer table of the bone, the nutrition from the under surface keeping the inner table intact.

This, however, is not the case, for in each of our specimens we find the outer table entirely destroyed, most of the inner table present, but presenting an irregularly circular necrosed area, corresponding to the centre of the destroyed outer table.

This indicates that the circulation is entirely unable to preserve the outer table, and we may expect it, in any case of extensive burn, to be cast off. The circulation in the inner table is sufficient to preserve the life of a large part of this table, but the central portion gives way, the entire thickness of bone being cast off and leaving the dura exposed.

Blood reaches the venous channels of the diploë directly through the bone overlying and underlying a given part, and the circulation must be free in a lateral direction from a given point. Hence, if the periosteum is destroyed over a given area, the direct blood supply from this area is cut off, and the blood supplied the underlying area must reach it from the dura below the inner table, and laterally from the zone of healthy bone around the margin.

Under the centre of the denuded area lies the part furthest removed from the healthy margins, and here the venous thrombosis and superadded infection are greatest, and the inner as well as the outer table are destroyed and cast off.

In most cases of this sort, no doubt the exfoliation of the exposed skull will continue in a favorable manner and without infection of the dura and the brain, but the course of the first of my cases shows that such will not always be the case.

When the periosteum over these large areas is destroyed, we may be sure that necrosis will follow, and I have endeavored to find out what could be done to prevent such a disastrous termination as followed the waiting plan in Case I.

It occurred to us that one might chisel off the outer table over the entire denuded area, and graft the surface of bone as soon as it showed satisfactory granulations. However, upon

examining a parietal, an occipital or a frontal bone, one at once sees that there are very thin areas, of considerable extent all about these bones, where the internal table is not distinctly separated from the external table, and where one could not remove the outer without the inner table. Indeed, on several fresh cadavers we were unable to make any satisfactory removals after this plan.

In the first case, which died thirty-one days after receipt of the injury, we found that the necrosed bone had not begun to separate at the end of four weeks, and in the case that finally recovered, we found that it was at least three and one-half months before separation was complete. From this we know that a period approximating three or four months is required for separation and removal of sequestra.

We noted in the burns of all the bones of the vault of the skull, that the outer table was cast off over the entire area which is bared of periosteum but that the inner table is only destroyed over a small area corresponding to the centre of the necrosed outer table, and that the brain infection is received by contact with this inner area of inflamed bone.

If drainage is established at this central point, infection should not travel through the dura, and proper dressings ought to protect the brain until such a time as the rest of the necrosed bone is thrown off and the whole area covered with grafts.

Our suggestion for treatment is, therefore, that every such case be treated antiseptically until the sloughs of the soft parts have been cast off or cut away and the bone left bare and clean. This will only take a few days. After this, a trephine opening about half an inch in diameter should be made over the centre of the denuded bone, and the button removed down to the dura.

The wound should now be dressed antiseptically until such a time as the denuded bone is cast off, the drainage provided for at the centre being relied upon to take care of any infection which reaches the dura, after which the whole area should be grafted, as was done in our second case.

THE OPERATIVE TREATMENT OF CANCER OF THE LARYNX.*

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CANCER of the larynx, whether considered from the point of view of the laryngologist or the general surgeon, presents one and the same problem. Can the victim of this dread disease be subjected to any form of treatment which will offer a probability or possibility of cure, or, if not, can anything be done to mitigate his sufferings?

From the earliest period at which the disease was recognized, not one authentic case of carcinoma of the larynx was ever cured except by early surgical removal of the disease.

As the death rate, therefore, in this condition treated by non-surgical methods has been, and is, 100 per cent., no time need be wasted in the consideration of non-operative treatment.

Four methods of radical surgical treatment have been proposed. First, intralaryngeal removal; secondly, thyrotomy, allowing exposure of the diseased area and removal of the lesion with subsequent closure of the laryngeal cavity; thirdly, partial laryngectomy; and fourthly, total laryngectomy.

While authentic examples of the successful removal of a malignant growth from the larynx by intralaryngeal methods have been recorded by Franckel and others, and while in a few rare instances freedom from recurrence has been observed for a sufficient length of time to justify the belief that a radical cure has been obtained, the gross uncertainties of such a procedure, and the almost uniformly disastrous results which have followed the method, have led to its general condemnation and abandonment.

Thyrotomy or laryngotomy, although first performed by

* Read before the Section in Laryngology, New York Academy of Medicine, May 21, 1909.

Brauers in 1833, was slow in acquiring surgical popularity, largely from the fact that in the beginning only advanced cases were operated upon and the results were correspondingly disappointing. Von Bruns, forty-five years later, in 1878, succeeded in collecting only 19 cases in which the operation was attempted for undoubted malignant growth. Of these, two died from the effects of the operation. Of the 17 who survived the operation not one was known to live more than a few months, the longest being the case of Sands, in which death occurred without local recurrence 22 months after the operation, but in which autopsy revealed metastasis in the kidney and suprarenal gland.

The publication of this report served for a time to discourage further employment of this method, until 1889, when Butlin again advocated the operation, and demonstrated that in early cases of intrinsic cancer, while the growth was limited to the vocal band or adjacent soft parts, thorough removal gave a fair chance for radical cure. In 1900 this author reported to the International Congress at Berlin, 27 cases of thyrotomy for malignant disease, with 3 deaths, and 3 cures of three years duration. Last year (1908) Mr. Butlin reported to the International Congress of Surgery at Brussels, 21 personal cases operated upon since 1890 with one death, and 12 patients alive and well three years after operation. At the same meeting Gluck reported nine personal cases of carcinoma treated by this method without mortality, 7 remaining well without recurrence,—period of time not stated; one submitting to a total laryngectomy six months after operation for recurrence, and one dying 2½ years after with visceral metastasis.

Semon, who with Butlin was one of the pioneers in the modern plan of treating all early intrinsic cases by this method, reports 19 personal cases with one death, 76 per cent. of cures lasting one year (he never having observed a recurrence after the first year). Since Semon's masterly presentation of the subject in America in 1904, the operation has steadily grown in favor, and is to-day the operation of choice in early cases of intrinsic cancer. I can not do better in this connec-

tion, than to quote Semon's advice regarding indications. "All intrinsic cases of cancer, not too extensive, not too near the posterior wall and not infiltrating the cartilages ought to be treated by thyrotomy."

Partial or hemilaryngectomy, first practiced by Foulis in 1878, is indicated in cases of unilateral intrinsic disease in which the lesion extends too far backward to promise a favorable result by simple thyrotomy, or when there is reason to believe that the perichondrium or cartilage is involved. As early as 1884 Hahn showed that the mortality was far below that of total laryngectomy. In 1897 Sendzick published 110 cases with a death rate of 26.3 per cent. Chiari reported 32 cases with 8 deaths, or 25 per cent. In 1902 Hartley reported 4 personal cases without mortality, and last year Gluck reported his own series of 43 cases, also without mortality.

Regarding the permanent results following this operation, Powers and White in 1895 recorded 101 cases, with 8 alive and well three years from the date of operation. Butlin in 1900 reported a series of 23 cases, of which 4 were free from recurrence at the end of three years.

Of Gluck's 43 cases, 5 of carcinoma and 2 of sarcoma were alive at the end of three years, while 13 had recurrence and later submitted to total laryngectomy.

Although the indications for this operation are not as frequently encountered as for thyrotomy or total laryngectomy, it has the great advantage that it preserves the normal oral or nasal respiration, and not infrequently allows the patient to retain a speaking voice of fair quality.

While there is a widespread impression that at present the mortality of this operation is higher than that of total laryngectomy, due to the fact that there is more difficulty in completely protecting the air passages from the secretions of the wound and pharynx, the statistics of Hartley and Gluck show that with careful technic the death rate is as favorable as in any of the other major operations in this region.

Total laryngectomy was first performed by Watson of Edinburgh in 1866. He was followed by Billroth, Heine,

Maas, Czerny, and others. The first successful laryngectomy for malignant disease was that of Bottini, whose patient lived six years.

During the earlier period of this pioneer work, the results were so unfortunate, both as regards immediate mortality, and permanent cures as to render the procedure almost prohibitive.

Hartley, in a careful statistical review of the operation published in 1902, showed that prior to 1889 the death rate from operation was between 40 and 50 per cent., and the permanent cures only 7 per cent.

The cause of the immediate mortality of this operation was recognized by all careful observers to be, first the occurrence of inhalation pneumonia, and second the extension of infection from the wound downward along the cellular planes of the neck to the mediastinum.

The first notable advance in technic was that proposed by Gluck in 1881, who suggested and practiced prophylatic resection of the trachea and implantation of the distal extremity through a buttonhole cutaneous wound just above the suprasternal notch, thus cutting off all connection of the air tube with the wound and preventing thereby the entrance of pharyngeal mucous and wound secretions. He also advised complete closure of the pharyngeal wound and generous packing with iodoform gauze. The employment of the Trendelenberg posture successfully prevented the entrance of blood into the trachea during the operation, which still further reduced the immediate risk.

Since this period the reported results show a steady improvement. Terebinski, in 1904, collected 188 cases with a mortality of 27.7 per cent. Schmiegelow collected 54 operations between 1890 and 1897 which showed a death rate from operation of 22 per cent. Moline, 81 cases with 15 per cent. mortality. Jackson 9 personal cases with one death, or 11 per cent. In Gluck's latest report, made to the International Surgical Congress at Brussels last September, he gives a total of 128 personal cases, and states that he has had no operative

death for the past four years in uncomplicated cases of total laryngectomy.

Regarding the end results of total laryngectomy for malignant disease, von Bruns from statistics collected in 1890 gives 10 per cent. of cures three years from the date of operation. Powers and White in 1895 collected a series of 208 cases, of which 15 were known to be living at the expiration of three years. If we deduct 73 who died as a result of these operations from the total number, it gives a percentage of 3 year-cures of 11. Hartley in 1902 estimated the permanent cures as 15 per cent. In 1908 Gluck reports, of 128 operations 20 patients were alive and free from recurrence at the end of three years, or a trifle over 15 per cent.

Two operations have been suggested to diminish the suffering in advanced and inoperable cases, tracheotomy and the starvation treatment recommended by Dawbarn. We are all aware of the relief which tracheotomy gives to the patient whose cancer has advanced to the stage of laryngeal stenosis, and who is hourly dreading asphyxiation. The discomfort and annoyance of the tracheal cannula are gladly accepted by these unfortunate patients in place of the painful spasm, distressing cough, and increasing difficulty in obtaining oxygen.

Regarding the starvation method or cutting off the chief arterial blood supply to inoperable malignant growths in and about the larynx, it may be said that it is deserving of a trial particularly in cancerous growths situated at the superior aperture of the larynx with marked dysphagia and constant cough. It must be borne in mind, however, that the typical Dawbarn procedure, that of complete extirpation of both external carotids was intended for growths of the face, lips, tongue, mouth, and upper pharynx. As the larynx is supplied chiefly by the superior and inferior thyroids, ligation of three of these trunks will accomplish all and more in these cases, than the typical carotid extirpation.

The writer's experience is limited to a single patient, but the relief in this instance was so striking that a brief history of the case will be given.

A middle-aged man, a butler by occupation, was admitted to the Roosevelt Hospital in the spring of 1901 suffering from hoarseness, a severe spasmodic cough, difficult and painful deglutition. He had suffered from these symptoms for three or four months, and had lost 10 or 15 pounds in weight, chiefly from loss of sleep and an inability to swallow food in sufficient quantities to maintain his strength.

On examination, a large indurated ulcer was seen involving the intra-arytenoid fold, somewhat more to the right than the left of the median line. There was moderate involvement of the adjacent lymphatics. He refused radical removal on account of the dangers and uncertainties of result, but gladly consented to the palliative operation.

Under chloroform anæsthesia, the right superior and inferior thyroid arteries were exposed and ligated, and also the left superior vessel. Within 48 hours he experienced a marked change in all of the painful symptoms. He slept without coughing, and was able to swallow with progressively increasing comfort. The wounds healed kindly, he left the hospital, and returned to his work. An examination made by several members of this society three weeks after the operation, showed that the ulcer had been reduced in size, and the surrounding tissues had lost their œdema and acute hyperæmia. He continued in this comfortable condition for several months, but later submitted to a tracheotomy for stenosis. The man expressed the greatest gratitude for the relief he obtained, and his life was undoubtedly prolonged by the treatment.

As the writer has had no personal experience in intralaryngeal removal of cancerous growths, or in hemilaryngectomy, he will report briefly his experience with thyrotomy and laryngectomy.

Thyrotomy I have performed 16 times with one death. Of these 16 cases only 7 were for undoubted carcinoma.

Case I was that of a colored woman 41 years of age, with a recurrent epithelioma of the vocal cord. She recovered from the operation. Four months later she showed signs of a rapid recurrence, and total laryngectomy was performed (see Case I, under laryngectomy).

CASE II was that of a middle-aged woman who had had symptoms of papilloma for two or more years. As the growth began to infiltrate the cord, she was referred to the writer by her physician, Dr. Charles H. Knight of this city. Under chloroform anæsthesia a median incision was made in the thyroid cartilage, the interior of the larynx widely exposed, the growth removed from the vocal cord and submitted to immediate microscopic examination by frozen section. As the diagnosis was epithelioma, the surrounding soft parts were thoroughly removed to the cartilage, the larynx packed, and the tracheal cannula left in place. She recovered nicely from the effects of the anæsthetic, slept quietly for nearly an hour, then suddenly awoke with a violent paroxysm of coughing in which the tube was expelled, and she died before it could be replaced.

CASE III.—A man, 50 years of age, from Nanuet, N. Y., was admitted to the Roosevelt Hospital in July, 1904, suffering from a small intrinsic epithelioma of the left vocal cord. This was removed by thyrotomy, and the microscopic examination confirmed the diagnosis. He made a satisfactory convalescence, and remained well for two years and eight months, when he died of lobar pneumonia without any symptoms of a return of his laryngeal trouble.

CASE IV.—Man, 49 years of age. Symptoms of laryngeal growth on left vocal cord for about one year. As the growth began to infiltrate the tissues of the cord, he was referred by Dr. H. Holbrook Curtis to the writer for radical removal.

On October 6, 1903, thyrotomy was performed, and the left cord and surrounding soft parts to the cartilage removed. He made a satisfactory recovery. Microscopic examination of the specimen showed it to be epithelioma. Two months later he returned, suffering from an apparent recurrence. A second thyrotomy was performed and a granulation removed together with a small area of the adjacent cartilage. His recovery from the second operation was uneventful. Examination of the specimen showed only granulation tissue. Two weeks ago I examined this patient and found no trace of his former disease, five years and eight months from the date of his first operation.

CASE V.—A man, aged 60, was admitted to the Roosevelt Hospital, in July, 1906, suffering from a small nodule on the left vocal cord. Exposed by thyrotomy the growth was removed

together with the adjacent soft parts to the cartilage. Microscopic examination of the specimen proved it to be epithelioma. He made a smooth recovery, but two months later returned with a slight recurrence. A second thyrotomy was performed and the growth removed together with a portion of the adjacent cartilage. He recovered from the second thyrotomy, only to return six months later for a terminal tracheotomy.

CASE VI.—A man, 54 years of age, was admitted to the hospital in August, 1905, with carcinoma of one vocal cord. The diagnosis was confirmed by microscopic examination of the specimen removed by Dr. Jonathan Wright. Thyrotomy, with complete removal of diseased area. Smooth convalescence, patient left the hospital on the twenty-second day. Nine months later the patient was re-admitted with a recurrence which involved both sides of the organ, and submitted to total laryngectomy. (See Case VIII of laryngectomy.)

The technic followed in these cases has been practically the same, and was modelled upon that practiced by Butlin and Semon. In my first case I undertook a preliminary tracheotomy. On the second day, however, there was a sharp rise of temperature, with cough and pains in the chest. The cannula was immediately removed and the symptoms subsided. A week later she was again tracheotomized and thyrotomy and removal carried out at the same time.

The anæsthetic has been chloroform in the majority of instances, although ether has been employed in a few later.

A median incision is made from the upper border of the thyroid to a point just above the suprasternal notch. The lower part of this is deepened and the trachea exposed. When all bleeding has been arrested, the trachea is opened and a sponge plug or tampon, to which has been tied a double loop of strong silk, placed in the upper segment of the air tube, the distal end of the silk loop clamped with an artery forcep and the cannula introduced. From this time the anæsthetic is administered through the tracheal cannula. The upper part of the incision is next carried down to the cartilage, the thyrohyoid membrane incised, and the thyroid, cricothyroid membrane, and occasionally the cricoid cartilage, divided in

the median line, freely exposing the laryngeal cavity. The two halves of the larynx are next widely retracted and the mucous membrane swabbed with a 4 per cent. solution of cocaine, or cocaine and adrenalin. If any doubt exists regarding the competence of the sponge tampon it is re-inforced by gauze packing from above, to prevent the possibility of blood entering the trachea. The growth is now examined and its extent appreciated. If the case is a suitable one for removal by this method, the tumor, together with a generous margin of healthy tissue, is removed down to the cartilage. Bleeding points are controlled by clamps and fine catgut, by the use of peroxide of hydrogen, or the small cautery point. In my earlier cases I packed the laryngeal cavity with one piece of fluff gauze after removal of the sponge tampon and any gauze employed for preliminary packing of the trachea. The packing was generally removed on the second day, the cannula on the third. Recently I have omitted the postoperative packing, and removed the cannula on the day following the operation.

The only case in which I have departed from the above outlined technic, is one in which I omitted the tracheal plug, but depended upon Rose's position to prevent blood from entering the trachea, and used a rectangular incision.

The personal experience of the writer in total laryngectomy is limited to eleven cases. Of these, five died as the result of the operation and six recovered. Of the six that survived the operation, one woman is alive and well ten years and three months from the date of her operation. One man is alive and free from recurrence three years and one month after operation. A third patient alive and well two years and four months. Of the other three, one died of pneumonia shortly after operation, one had a recurrence four months after his discharge from the hospital, and a third the most favorable case of the series, was free from recurrence when last seen, but since that time we have been unable to trace him.

CASE I.—Colored woman, 42 years of age. Had what was supposed to be a small non-infiltrating papilloma removed from her left vocal cord in the summer of 1898 by Dr. F. C. Ard of

Plainfield. He kept the specimen, but felt so sure of its benign nature, that he did not have it examined microscopically. Six months later she returned with a small recurrence. He then had the original growth examined. It was pronounced epithelioma by the pathologist of the Presbyterian Hospital. Case referred to the writer for thyrotomy; this was done on November 24, 1898 (see Case I, thyrotomy series).

In February, 1899, I received a hasty summons to the Muhlenberg Hospital in Plainfield to see the patient, who was suffering extreme dyspnœa. On laryngoscopic examination, nearly the entire interior of the larynx was found to be filled with recurrent growth. She was offered the choice of a tracheotomy with temporary relief, or of total laryngectomy with a possibility of radical cure. She eagerly accepted the latter. Under chloroform and oxygen anæsthesia, after a low tracheotomy and plugging the upper segment of the trachea, the larynx was exposed and dissected from the surrounding soft parts. Both superior thyroid arteries were secured near their orifices, the superior laryngeal nerves divided and the lymph-nodes and lymph-bearing areolar tissue in the neighborhood removed. The trachea was next divided about the first ring, and the larynx separated from the œsophagus, and finally removed by cutting through the thyrohyoid membranes. The pharyngeal wound was closed with two layers of silk, the tracheal cannula left in place, the wound partly united and packed with gauze.

A moderate reaction followed the operation. Water was swallowed the fourth day. On the fifth day, as a result of a violent paroxysm of coughing, the pharyngeal wound opened. In other respects she continued to do well, and was discharged from the hospital four weeks later. She was shown to this Section on March 22, 1899, by Dr. F. C. Ard. She is still alive and well, ten years and three months having elapsed since the operation.

Case II.—A man, 51 years of age, suffered from cough and hoarseness for ten months. Referred to the Roosevelt Hospital by the laryngological department of the Vanderbilt Clinic, with diagnosis of carcinoma. Preliminary tracheotomy December 17, 1901, total laryngectomy two days later. Death from sepsis extending to mediastinum, and inhalation pneumonia on the tenth day.

The writer was strongly impressed that the preliminary tracheotomy was a mistake in judgment in this case, as considerable reaction and cough followed, which had not entirely subsided in the two days which had elapsed since the first operation. We resolved not to employ it in the future, but to employ the same technic which was carried out in the first case.

CASE III.—A middle-aged man was referred to the writer in the autumn of 1902, suffering from cough, loss of voice and dyspnœa on exertion. The duration of the symptoms is not mentioned in my notes, but the disease was well advanced, and considerable loss of bodily weight and strength had occurred. The case was seen by a number of laryngologists, all of whom confirmed the diagnosis of epithelioma.

Under chloroform anæsthesia, total laryngectomy was carried out by the same technic as in Case I. Very little reaction followed the operation. The wound was dressed daily, and the amount of infection was trivial. He took water on the second day, and sat up in bed on the third. A leak occurred in the pharyngeal wound, and he was thereafter fed through a tube. He left his bed on the tenth day, and three or four days later was presented to my class as an example of a successful laryngectomy, although a small pharyngeal fistula was still present. A day or two later he passed the entire afternoon in the open air, and in the evening had a chill and rapid rise of temperature. Lobar pneumonia developed, and he died in three days.

CASE IV.—Male, aged 65, with advanced disease. Operated upon at the Roosevelt Hospital on May 6, 1903. The same technic was followed as in the last case. Pneumonia developed almost immediately, and death followed on the fifteenth day.

CASE V.—A healthy Adirondack guide about 45 years of age, was admitted to the hospital suffering from extensive intrinsic disease, involving both sides of the larynx. My notes in this case are defective, but I remember distinctly regarding him as a particularly good operative risk, in spite of the rather advanced stage of the disease. He was operated upon in the same manner as the last two cases. There was no shock and he showed no untoward symptoms for 24 hours. On the second or third day he developed pneumonia and died.

Reviewing my results up to this period, it will be seen

that of five patients, only two recovered from the immediate effects of the operation, and only one remained well. All died of pneumonia: a death rate of 60 per cent. About this time I became interested in the remarkable results obtained by Gluck of Berlin, he having reported a series of 22 total laryngectomies, with but one operative death. Feeling, as I did, that my unfortunate results were due to technical errors, I resolved to visit Berlin and see Gluck's work. I was cordially received, and as a result of my observations found that his method differed from the one I had employed in several particulars. He employs no preliminary tracheotomy; he uses the Trendelenberg posture; he exposes the region by a rectangular cutaneous flap. He first opens the air passage from above, through the thyrohyoid membrane, and then removes the larynx from above downward; he draws the trachea outward from its bed, and attaches it to the cutaneous wound just above the sternal notch; he immediately introduces a feeding tube through the nostril into the stomach, and administers food at an early period. He also employs more generous tamponade of the wound, using iodoform gauze.

In following the after treatment of some of his cases, I observed no pneumonia and no evidence even of marked tracheal irritation. Patients were given an abundance of food as soon as they could retain and digest it. This to me appeared a most important factor, as the painful deglutition and fear of leakage from the pharyngeal wound had kept my patients on a very limited diet for many days; and as the patients are for the most part old and feeble, with little resistance, the question of adequate nourishment seemed an important one. I returned home full of enthusiasm, resolved to carry out Gluck's technic to the letter. Two cases presented themselves shortly after my return, both, however, with advanced disease.

Case VI.—A man, aged 43, who had suffered from hoarseness and pain for two years. He also had progressive difficulty in swallowing, and a loss of 40 pounds in weight. Laryngoscopic

examination revealed an ulcerating epithelioma involving the superior aperture of the larynx.

CASE VII.—Also had extensive disease, but was otherwise in fair general condition.

Both of these patients were operated upon in the same manner, and the technic of Gluck was carried out to the letter. The postoperative course was similar in each instance. Neither suffered appreciably from shock. Both cases, however, quickly developed a peritracheal infection, favored in my judgment by drawing the trachea from its bed and opening up the deep cellular planes of the neck. Case VI, whose resistance was low, quickly succumbed to pneumonia and acute mediastinitis. Case VII, whose resistance was greater, continued his uphill fight against sepsis for a number of days, but at last died of acute mediastinal cellulitis and pneumonia. In the latter case the trachea quickly became detached from the skin and retracted below the upper border of the sternum, where it lay in a mass of necrotic tissue.

The result in these two cases was disappointing in the extreme. In reviewing the several steps of the operation I was convinced that there was no advantage in the rectangular flap, that the removal of the larynx from above downward presented more technical difficulties than from below upward, and in my hands resulted in a larger pharyngeal wound with greater risk of leakage and subsequent infection. I was absolutely convinced, also, that the plan of stripping the trachea from its bed was unwise, as it opened up the deep cellular planes of the neck to the always present and unavoidable infection from the tracheal secretions, and from any subsequent leakage which might occur from the pharynx.

I resolved, thereafter, to perform a preliminary tracheotomy at least ten days before removal of the larynx. At this operation I would also, as suggested by Crile, divide the isthmus of thyroid, expose the trachea for a considerable distance above the tracheal opening, and by means of iodoform gauze packing create an area of granulation tissue around the trachea which would prevent subsequent retraction and offer an effectual barrier against infection travelling downward in the peritracheal tissues. At the secondary operation I would not

attempt to raise the trachea from its bed in order to stitch its lumen to the skin, but, as suggested by Koschier, would content myself with destroying with cautery its mucous membrane above the cannula, and by frequently repeated packing prevent the entrance of wound secretions, both during the operation and during the subsequent dressings. This plan has been followed in the four operations I have performed since that time. In addition I have introduced the nasal stomach tube at the time of operation, and kept in place from 7 to 10 days, feeding the patients as soon as possible after operation. By following this plan I am able to report that all of the four patients made satisfactory recoveries. A brief résumé of each may not be out of place.

CASE VIII.—A laborer, aged 55 years, was admitted to the Roosevelt Hospital in May, 1906, suffering from recurrent carcinoma (see thyrotomy series, Case VII). Laryngoscopic examination showed a bilateral epitheliomatous growth. Preliminary tracheotomy and packing of wound. At the secondary operation the larynx was removed from below upward, the tracheal stump being left in place and securely packed. Patient made a satisfactory recovery, and was discharged in about four weeks.

CASE IX.—A female, aged 30, suffered for seventeen months from hoarseness, and a slight pain on left side of throat for two months. Laryngoscopic examination showed intrinsic growth situated on left cord and extending slightly to the right of median line. Diagnosis confirmed by microscopic examination of fragment. Preliminary tracheotomy in the manner above described. Twenty-three days later total laryngectomy under colonic anæsthesia. Smooth convalescence. Discharged on the twenty-eighth day.

CASE X.—The history of this case has been lost. Patient admitted to the hospital in moderately severe dyspnœa with extensive carcinomatous growth. Preliminary tracheotomy under chloroform. Secondary removal of larynx under colonic anæsthesia ten days later. Early feeding through nasal tube. Convalescence was uneventful. Six months later patient returned with recurrence in the tissues of the neck and was referred to the Department of Charities for future care.

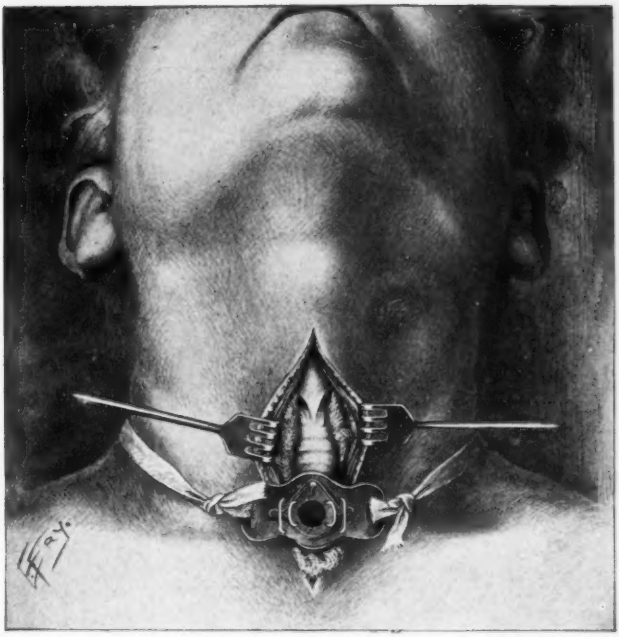
CASE XI.—The history of this case has already been reported by Dr. Harmon Smith, by whom he was referred to the writer. Briefly, the history was of tumor of the larynx of ten years duration. The tumor involved the left vocal cord and adjacent structures. Microscopic examination of a fragment removed by Dr. Jonathan Wright showed undoubted malignancy. Preliminary tracheotomy followed in fourteen days by total laryngectomy. Convalescence was rapid and uneventful. When last seen, five months after operation, there was no sign of recurrence. Since that time we have been unable to trace him, and his present condition is therefore unknown.

The rapid and satisfactory convalescence which occurred in the last four cases contrasts so strikingly with the results which followed my earlier operations that one is strongly inclined to the opinion that it must be due to the changed technic. While I lost one case of my earlier series in which I performed a preliminary tracheotomy, it must be remembered that I allowed only two days to intervene between it and the secondary operation,—a period far too short in which to establish a successful granulation barrier against peritracheal infection.

To recapitulate, my technic in total laryngectomy is:

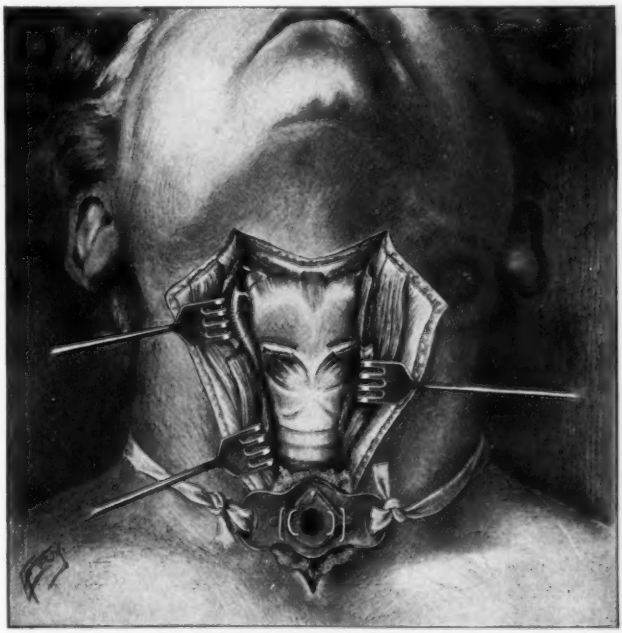
Under general anæsthesia, after the usual local preparation, a median incision is made extending from the cricoid to the sternal notch. The muscles are separated, exposing the isthmus of the thyroid, which is double ligated and divided. The separated edges are pushed to each side and the trachea freely exposed. A low tracheotomy is then performed and the cannula introduced, after which the upper part of the incision is united with silkworm gut sutures, and the peritracheal space generously packed with iodoform gauze both above and below the cannula (Fig. 1). The wound is dressed and the patient placed under a tracheotomy tent into which a small amount of steam is introduced by means of a croup kettle. The external opening of the tracheal cannula is constantly covered with four or five layers of gauze wet in warm boric acid solution, with a view of filtering the air which enters the

FIG. 1.



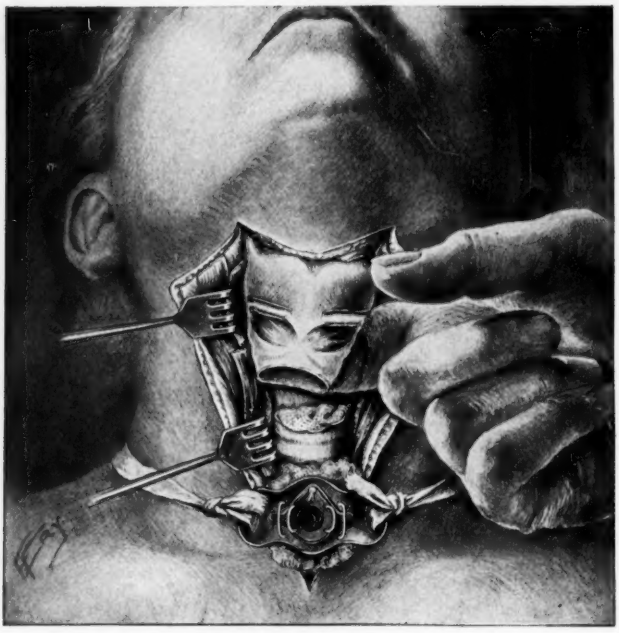
Preliminary tracheotomy with peritracheal tamponade.

FIG. 2.



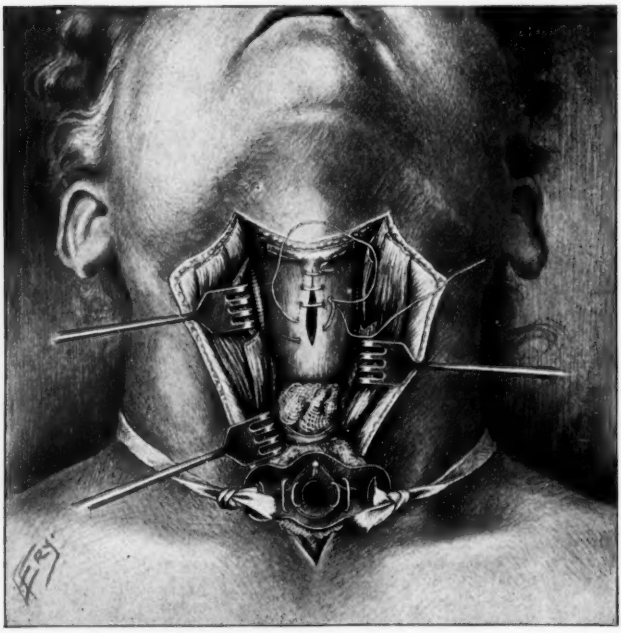
Exposure of the larynx and thyrohyoid membrane

FIG. 3.



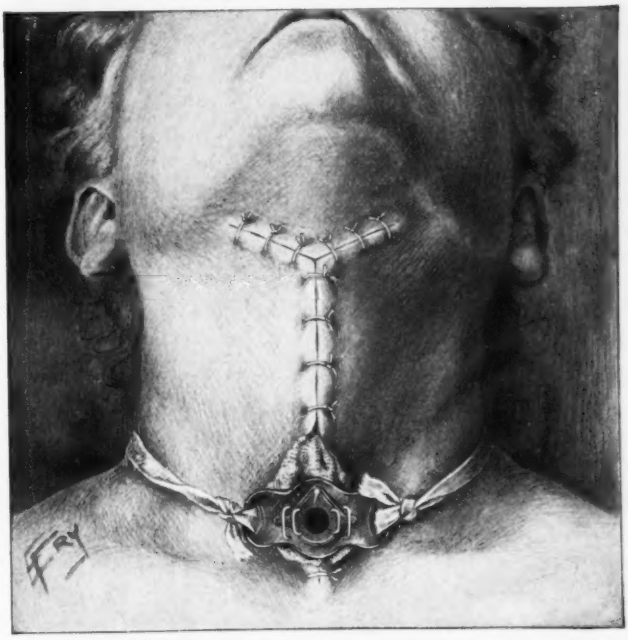
Division of the trachea, and separation of the larynx from the œsophagus.

FIG. 4.



Suture of the pharyngeal wound, and packing the upper segment of trachea.

FIG. 5.



Wound closed, with generous gauze packing about tracheal stump.

trachea. A special day and night nurse attends the patient. About ten days after the preliminary operation, if the patient has a normal temperature and is not suffering from cough and excessive tracheal secretion, the secondary operation is undertaken.

Chloroform is administered through the tube until the patient is anæsthetized, after which its administration is continued in the same manner, or colonic etherization is employed by means of the Sutton apparatus. The use of scopolamine 1/100 gr. and of morphine 1/6 gr. one-half hour before operation is a decided advantage in these cases, as it not only diminishes to a considerable extent the amount of anæsthetic required, but lessens the post operative vomiting, and insures a period of from one to four hours of freedom from restlessness after the operation, a period when most laryngeal cases are coughing and vomiting, and increasing thereby the always present tracheal irritation.

The patient is placed on a flat table with the head well extended. An incision is made from the body of the hyoid downward to the upper limit of the former cut. From the upper extremity of this incision two lateral incisions are made in an upward and outward direction extending to the anterior borders of the sternomastoid muscles. The two triangular flaps are turned outwards, the sternohyoid muscles divided just below their attachment and the sternothyroids detached from the cartilage (Fig. 2). The two superior thyroid arteries are next located and ligated. The superior laryngeal nerves are cut and all lymph-nodes and neighboring lymph-bearing areolar tissues are removed. The attachments of the inferior constrictors are next divided and posterior surface of cricoid partly separated from the œsophagus by blunt dissection.

When the larynx is thoroughly skeletonized, the tracea is severed just below the cricoid, and its distal extremity immediately packed tightly with gauze, completely preventing the entrance of blood or pharyngeal mucus. The forefinger of the left hand is next introduced into the upper or laryngeal segment of the tube, and the larynx gently raised from the

œsophagus, any remaining attachments being separated by gauze sponges (Fig. 3). When the larynx is thus completely separated from the œsophagus, the tips of the thyroid cornua are divided, the thyrohyoid membrane incised and the larynx removed.

The pharyngeal wound is then packed with gauze to prevent excessive contamination of the wound, and the parts carefully inspected for evidences of remaining disease. The oval pharyngeal wound is next tightly closed by two layers of suture, the first of plain catgut, the second of chromic catgut (Fig. 4). After closure of the pharyngeal opening, the entire upper wound is temporarly packed with wet formalin gauze, while the tracheal stump is prepared for closure. This is accomplished by removing redundant tissue above the cannula opening, dissecting out or destroying with cautery the mucous membrane, and packing firmly with iodoform gauze above the tube. A No. 30 F. rubber feeding tube is then introduced through the left nostril into the œsophagus, and secured by a safety pin and plaster straps to the face. The wounds are next united above, with generous gauze packing about the tube (Fig. 5.)

The after-treatment is the same as following the preliminary tracheotomy. Water is given through the tube as early as the morning following the operation, if there is no nausea. Milk, coffee, egg nogg, meat juice, and soups follow as soon as possible. No attempt at swallowing should be made for at least seven days, after which the tube can be removed. The wound should be dressed at least once every day, and two or three times if there is infection or pharyngeal leakage. The tracheal stump is quickly covered with granulations, and gives no trouble. The patients continue with the silver cannula.

THE CLOSURE OF THE WOUND AFTER THE RADICAL AMPUTATION OF THE BREAST.

BY JOSEPH WIENER, M.D.,

OF NEW YORK,

Adjunct Surgeon, Mount Sinai Hospital.

HAVING recently had occasion to do three radical amputations of the breast for carcinoma within twenty-four hours, the method of closing the extensive wound was brought up for discussion by one of the assistants, who expressed surprise at the method I employed. The method is the one I have used in all my cases, with slight modifications, during the past ten years. To quote from an article by J. C. Warren of Boston: "The closure of the wound in this operation has always been a difficult problem, since it has been decided that the whole integument of the breast should be included between the incisions. Any method which permits of an easy approximation of the edges of the wound is out of date. The method of grafting adds materially to the length of the operation and leaves a most unsightly scar. The removal of the breast is at best a demoralizing ordeal to most patients, and every effort should be made to procure as rapid healing and as little unsightly a cicatrix as possible." Halsted, on the other hand, says: "To attempt to close the breast wound more or less regularly by any plastic method is hazardous and, in my opinion, to be vigorously discountenanced. The oval flap, whatever the direction of its long axis, removes, so far as the cure of the disease is concerned, a circle of skin whose diameter is not greater than the short axis of the oval. I still believe in the removal of a very large circle of skin and endorse the remark of my ex-house surgeon, Dr. Follis, that the operator whose duty it is to close the wound should not be entrusted with the planning of the skin incision." Halsted acknowledges that the grafting does interfere with very early arm movements.

The two opinions quoted above represent fairly well the diverging views still held in regard to closure of the wound after the radical operation. We believe the opposing views can be harmonized. No one will gainsay that a grafted area after breast amputation tends to form an unsightly scar. I have seen such scars months later, and they are not things of beauty. On the other hand, it will be said that we are not doing a cosmetic operation, but a deliberately mutilating operation designed to permanently cure an extensive carcinoma. Perfectly true; just as it is perfectly true that a large circle of skin should be removed with the breast. But are we justified in concluding from these premises that we must use grafts to cover such an area, that we must unnecessarily prolong the length of the operation, that a plastic operation is to be deprecated and that our unfortunate patient must carry around a most disagreeable scar? Such would seem to be the conclusions of those who, as a routine procedure, without attempting to close the wound completely, regularly use skin grafts in every operation of this kind. The writer rather tends to agree with the views of Warren, that the removal of the breast is a sufficiently demoralizing ordeal to warrant our making every effort, *consistent with the safety of our patient,* to bring about a speedy recovery with the best possible cosmetic result. In so doing we would not save the smallest piece of skin that we thought ought to be removed with the tumor. We believe in and practice a very wide excision of skin, together with breast, tumor, pectoral muscles and lymphatics. We do not allow ourselves to be influenced, when making the original incision, by any fear that we may not be able to subsequently close the wound. Our excision of skin is just as extensive as that practiced by those who graft in every case. It has frequently happened to the writer that an assistant or onlooker has expressed the opinion that it would be impossible to close the enormous wound without grafting. And yet during the ten years that we have practiced the radical operation we have in every case been able to cover the denuded area by transplanting the breast from the oppo-

FIG. 1.

First dressing after radical amputation of breast, six days subsequent to operation. The right breast before operation was almost in the axillary line. At the completion of the operation part of the breast overlapped the median line,—it has already been somewhat drawn back to the right side. Note distance of shot and plate sutures from edges of incision. Note supraclavicular drain emerging from stab wound.

The dotted line represents the usual incision,—it is carried around the lower border of the breast in the shape of an ellipse.

site side. No one, we believe, will deny that if we are able to close the wound in this way the resulting linear scar will be far more pleasing to the patient than a broad grafted area. Quite recently a private patient, an unmarried lady of 39, on whom the writer had performed this operation over six years ago, presented herself for observation. The wound had healed by primary union and the resultant linear scar was scarcely noticeable.

The incision is represented by the dotted lines in the illustration (Fig. 1). If the supraclavicular glands are to be removed through the same incision then the racquet-shaped incision rises more vertically upward towards the clavicle. In some cases these glands are removed through a separate incision. We always remove both pectoral muscles *in toto*. We begin our dissection by dividing the tendon of the pectoralis major, then dissecting backwards, remove axillary contents with the muscles, tumor, and breast all in one piece. By undermining the opposite breast and using shot and plate sutures any defect can be completely covered. The opposite breast is usually flabby and there is much redundant skin, so that the technical difficulties are usually not great. In several cases the nipple of the opposite breast at the end of the operation was in the median line; some part of the opposite breast regularly overlaps the median line. But so great is the elasticity of the skin that in a few weeks the breast has returned almost to its normal position. Furthermore, in many cases, the breast will be so flabby and pendulous that the nipple is almost in the axillary line before we begin our suturing. In such cases, at the end of a few weeks the breast will be found in a perfectly normal position, in spite of the fact that it was drawn over to the opposite side to cover the defect.

In mobilizing the breast a few free incisions are made behind the breast, the edges of the incision being forcibly pulled away from the chest wall. Much of this dissection can be done bluntly; a few vessels require ligation. The dissection, blunt or sharp, proceeds between the posterior surface of the breast and the fascia covering the pectoralis major.

The fascia itself should not be injured, but the loose areolar tissue between this fascia and the breast should be divided. This can be done in a few minutes; and the skin flap towards the axilla on the affected side, where the dissection has already been done, is freed as far out as possible. This should be especially thoroughly done at the lower angle of the wound, as it is near the lower end of the denuded area that most tension is usually encountered in passing the sutures. Two assistants now forcibly adapt the margins of the wound, and the amount of tension can then be readily ascertained. If necessary, the skin can be mobilized in a similar manner below the lower border of the incision; we have done this in most of our cases and it has helped us to close some wounds which we would otherwise have been unable to close. In one case where on account of the size of the tumor an unusual amount of skin had to be sacrificed, after mobilizing the opposite breast, we made two horizontal incisions, one above and one below the breast, and we were then able to bring (slide) the breast well over to the opposite side and thus close the enormous defect. But this procedure will rarely be necessary. It is really surprising how readily the usual defect can be covered by the above method. We use two or three shot-and-plate sutures and are careful to place them two and a half or three inches from the margins of the wound on each side. Since using a small thick pad of gauze between the lead plate and the skin, we no longer see the little area of necrosis due to pressure of the plate against the skin. Heavy silkworm is used for this suture, a perforated lead bullet is fastened to the end of the suture, then comes the perforated lead plate with edges slightly turned up away from the skin. The free end of the suture to which the needle has been added, is passed through the centre of the small gauze pad. This pad should overlap the edges of the lead plate at least a quarter of an inch all around. The needle is then passed through both skin flaps at some distance from the edges. Without unthreading the needle, it is passed through a second gauze pad which is pulled down close to the skin. The needle is then removed and the silkworm suture

passed through the lead plate and lastly through the perforated bullet. An artery forceps is placed on the end of the suture and the other tension sutures are passed in a similar manner. These sutures are prepared before the operation, and take but a minute to apply. An assistant forcibly approximates the edges of the wound by crowding the breast over towards the affected side. The operator quickly adjusts the shot-and-plate sutures, and a running suture of fine silk accurately brings together the edges of the skin. The arm and shoulder portions of the incision can be partly approximated with strips of Z. O. plaster. Drainage is provided for in the usual manner by a tube introduced through a stab opening low down in the posterior axillary line. If the supraclavicular glands have been removed without making a separate skin incision, this space is drained through a small opening in the skin above the clavicle. The first dressing is done on the sixth or seventh day and all sutures are then usually removed. After removing the sutures we are accustomed to keep the skin edges approximated with numerous strips of Z. O. plaster.

This simple method of wound closure has been so satisfactory in our hands, and so gratifying to our patients, that we feel justified in recommending it to others.

THE POSTOPERATIVE TREATMENT IN CASES OF TYPHOID PERFORATION.

REPORT OF FOUR CONSECUTIVE CASES OPERATED UPON WITH RECOVERY.

BY PEREGRINE WROTH, Jr., M.D.,

OF HAGERSTOWN, MD.

DURING my term as Resident Surgeon at the Union Protestant Infirmary of Baltimore, 1907–1908, I had the opportunity of caring for four cases of typhoid perforation. After having operated on these cases I was able to employ the so-called Fowler-Murphy treatment of peritonitis with the result that all four cases recovered.

The object of this paper is to call attention to the modified Fowler-Murphy treatment of general peritonitis as applied to the peritonitis following the perforation of typhoid ulcers, emphasizing the fact that under such conditions the primary disease may be disregarded almost with impunity and the patient placed in an upright position and kept there for days, if need be, without experiencing any ill effects.

Previous reports have laid stress on the need for drainage, but have regarded the patient as still demanding rest in the recumbent position and have relied on flank incisions to secure drainage by gravity.

The four cases on which I operated in the summer of 1908, all of which recovered, were set bolt upright in bed immediately after operation and given salt solution continuously, by rectum.

Symptoms.—It is not my intention, here, to discuss the symptoms following the perforation of a typhoid ulcer, nor the physical signs by which such perforation may be recognized. It will be interesting, however, to note a few points shown in this series. By all odds the most important and the most constant symptom is abdominal pain, "sudden, sharp, severe." As characteristic as its suddenness and severity is

its paroxysmal nature. In the cases under discussion this point was well shown; in no one of them was the pain constant, in three of them the patients went to sleep after the first paroxysm. One of them, a little girl of six years, went to sleep after her first complaint before the house doctor could be called and slept peacefully for three hours. Another, a nervous, almost hysterical man, slept one and a half hours between pains, and a third, a boy who filled the ward with his cries at first, slept brokenly a good part of the time between the making of the diagnosis and his transfer to the operating room. The severity of the pain, at least in these cases, made it quite evident that there was something unusual going on, though three of the cases were in children, all of whom had complained of more or less pain throughout the course of the disease. One boy, by the urgency of his complaints, had alarmed us many times, and we had come to regard him as a chronic grumbler; but when finally he did come to experience the pain attending an actual perforation, there could be no doubt that at last his suffering was real. In this short series, sudden, sharp, severe abdominal pain, coming in paroxysms, was the only constant symptom.

Signs.—In all these cases the characteristic signs of tenderness, rigidity, and spasm were present, but in varying degree. Distention was present in only one, and then was not marked. The presence or absence of movable dulness in the flanks was not noted. One sign, to which by most authorities very little importance is attached, was present in three of the four, and its absence in the fourth was fully explained on opening the abdomen; I refer to the rapid and complete disappearance of liver dulness while there was no or very slight abdominal distention. The study of this sign in the series under consideration, and in three other cases which have come under my observation, tempts me to speak strongly of its value as positive evidence, at least, of gas free in the peritoneal cavity—a condition which, arising in the course of typhoid fever, points in almost every case to the perforation of an ulcer; and even in the few cases in which the gas

does not owe its presence to a perforation, the indication for exploratory laparotomy is absolute. In three of the cases there was a rapid and absolute disappearance of liver dulness while there was no abdominal distention. In the fourth case the liver dulness was not diminished but the diagnosis of perforation was made on other grounds. At operation in this case there was no evidence of gas escaping when the peritoneum was nicked; there were no bubbles seen when the intestine was drawn up; there was no free fluid; there was, at first sight, practically no evidence of peritonitis. Finally, however, a piece of omentum was pushed back and there occurred a rush of bubbling, yellow fluid; and a perforation in the ileum, until this covered loosely by omentum, was revealed. In this manner the persistence of liver dulness was explained.

In connection with this point I wish to refer to three cases, not of this series, which came under my observation during my residence at the Union Protestant Infirmary:

(I) A case of a woman with typhoid fever in whom a perforation was suspected on account of pain, tenderness, rigidity, and extreme abdominal distention. Notwithstanding a marked distention of the abdominal walls, there still remained, on percussion, about one and a half inches of liver dulness. A laparotomy was done, no sign of perforation was found, and an uneventful recovery ensued. (II) A typhoid fever patient, complaining of some slight general abdominal pain, who on examination showed no signs definitely pointing to perforation, but with a non-distended abdomen there was complete disappearance of liver dulness. Operation disclosed no perforation (nor at autopsy did closest search of gut from rectum to stomach reveal any); but as the peritoneum was nicked there was a stream of escaping gas, which was plainly felt in the face of the operator. In the right iliac fossa there was a collection of pus; the cæcum and lower part of the ileum was thickened, red, and covered with fibrinous exudate. The appendix and gall-bladder were normal. There probably had been a peritonitis set up through the almost gangrenous walls of the cæcum and ileum, possibly through some perforation too small to be evident to the naked eye. In this case the deter-

mining factor in the question of operation was the absence of liver dulness with a non-distended abdomen, no other signs being definite enough to signify the necessity for surgical interference. (III) A case seen several years ago, brought in with a diagnosis of typhoid fever. There was a rapid disappearance of liver dulness followed by an extreme distention of the abdominal walls; and though the patient was perfectly conscious, he complained of no pain, nor could we at any time elicit any tenderness nor make out any spasm or rigidity of the abdominal walls. Death occurred in a few days; and when the balloon-shaped abdomen was opened at autopsy, there was an outrush of gas and a complete collapse of the walls. The intestines were found absolutely collapsed, lying against the posterior wall of the abdomen, bathed in pus. A perforation admitting the thumb was found at the junction of the cæcum and ileum. In this last case the belief that the obliteration of liver dulness with a *distended* abdomen was of no diagnostic importance prevented an exploratory incision.

The evidence of these cases seems to me to show: (1) in a *scaphoid or non-distended abdomen* the obliteration of liver dulness is extremely suggestive of free gas in the peritoneal cavity; (2) in a *distended abdomen* it is a sign which is extremely suspicious; (3) the *non*-disappearance of liver dulness in an abdomen even when enormously distended gives good ground (unless other signs are very definite) for the belief that the intestinal tract is not the seat of a perforation.

In order to avoid repetition it will be better at this point to indicate the routine treatment of the cases of this series, before perforation, and also give in some detail the postoperative treatment.

Treatment Before Operation.—Each case of suspected typhoid was isolated on admission. The temperature, pulse, and respiration were observed and noted every three hours. The diet consisted of the albumin of two eggs in four ounces of water, slightly flavored with orange or lemon juice, alternating every three hours with four ounces of milk to which was added two ounces of lime-water. Every three hours, while temperature was 102.5° F. or over, a sponge bath with water ranging from 80° F. to 90° F., lasting twenty minutes,

was given. No cathartics were used, but every second day, if necessary, an enema of 500 c.c. of soap suds was administered. Water was given freely as desired, and if need be was forced upon the patient. During the night, unless the temperature was running very high, the patient was allowed to sleep for one period of six hours without being disturbed for temperature taking or nourishment. In the case of children these same measures were carried out with slight variations, the diet being changed so that there was the albumin of one egg in a nourishment instead of two, and the sponge bath lasting for fifteen minutes instead of twenty.

Postoperative Treatment.—The general course of treatment after operation, allowing, of course, for a few unavoidable minor differences, was the same in the four cases. In the first place the patient on returning to bed from the operating room was placed as nearly bolt upright as was compatible with comfort and strength. In all these cases the patients were able to maintain the upright position more consistently than is the rule, and in no one of them were any untoward effects observed. This position was maintained uninterruptedly in all for at least four days, and in two instances the patients, seeming more comfortable in this position, were allowed to sit bolt upright for a week.

As soon as the patient had been placed in an upright posture the continuous administration of salt solution per rectum was begun. The apparatus used was one devised by myself for the purpose. It consisted of a metal frame holding a glass infusion flask and a glass funnel. The salt solution, controlled by a stopcock, was allowed to flow, one drop at a time at a fixed rate, from the flask into the glass funnel. By means of the stopcock the rate of flow could be regulated with a considerable degree of exactness. From the funnel the salt solution was conducted to the rectum through a long rubber tube terminating in a very fine rubber catheter. The salt solution was kept at the proper temperature by passing the conducting tube between two hot-water bags laid on a stand beside the bed. By means of this apparatus the majority of

patients can be given from two to six litres of salt solution per day for a week, without causing them any inconvenience, and with the loss of very little salt solution.

The drainage from the wound was profuse at the start, and at first resembled the fluid found in the peritoneal cavity at operation; but the character changed in from twelve to thirty-six hours so that finally the drainage was much less in amount and perfectly clear, hardly staining the dressings. In one case where a rubber tube was used to drain the pelvis the fluid flowing therefrom by the end of the second day could not be distinguished from the clear salt solution being introduced into the rectum. As long as the drainage was profuse the dressings were changed every four to six hours; but as it became less in amount, the dressings were changed at much longer intervals. The drains themselves were removed just as soon as it was thought their purpose had been fulfilled. When there were two drains, one of them at least was removed at the end of twenty-four hours. If the patient's condition demanded stimulation, strong, black coffee, first filtered, was mixed with the salt solution in the proportion of 400 c.c. of coffee to 600 c.c. of salt solution, and this mixture given for twelve hours at a time. In one case in which the continuous rectal administration of fluid was not successful, salt solution and coffee were given in smaller amounts every three or four hours. As soon as the patient was conscious,[1] fluid was given by mouth in small quantities, rapidly increasing to full liquid diet. As soon as the temperature became normal the patient was given soft-boiled eggs and the diet then rapidly increased until solid food was taken.

These patients were fed a little more rapidly than was our custom in the feeding of typhoid-fever patients, a quick return to normal body-weight and strength being especially desired.

[1] In practically none of the cases of peritonitis that I have seen treated by the Fowler-Murphy method at the Union Protestant Infirmary and elsewhere has there been any postoperative nausea while the patient was in the upright position.

REPORT OF CASES.

CASE I.—L. R.; female; white; aged 8½ years. This patient was admitted to the hospital on July 15, 1908, in what was probably her third week of typhoid fever. She showed a pretty severe type of the disease, being irrational part of the time. On July 17 and 18 there was slight bleeding from the nose. On July 19 patient had a small hemorrhage from the bowel. Immediately all nourishment was discontinued, and water restricted to two drachms every two hours. Small doses of paregoric were given, and large doses of calcium lactate. The patient was not allowed to be turned; and ice packs, given with the patient flat on her back, were substituted for baths. On July 21, forty-eight hours after the hemorrhage was observed, there having been no other signs of bleeding, water by mouth was allowed. At 12.45 P.M. of that day the patient complained of severe abdominal pain chiefly on left side about the level of the umbilicus. On examination, one hour later, the abdomen appeared slightly full but not distended; was held rigidly everywhere; was very tender wherever touched; and the liver dulness, heretofore extending an inch below the costal margin, entirely disappeared; leucocytes had risen from 5000 to 10,000. The diagnosis of perforation was made, but on account of difficulty in establishing communication with the family, a delay of four hours occurred before the operation could be performed. At 2.30 P.M. the patient had small, brown, fluid stool. At 2.45 P.M. she vomited a large amount of yellowish fluid. The pulse up to noon had averaged about 100; but from the time the patient first complained of pain it rose rapidly to 122 then to 128. The temperature at 12 M. was 100.6° F. At 3.00 P.M. it was 103.9° F. Respirations remained unchanged. At 4.45 P.M., four hours after the patient had first complained, she was taken to the operating room.

Operation.—Anæsthetic: ether. Time of operation: twenty-five minutes. Low right rectus incision. Abdomen found full of clear yellow fluid without odor. Cæcum located; ileum followed up; perforation admitting a lead-pencil found ten inches from ileocæcal valve; perforation closed by purse-string suture of fine black silk, reinforced by two mattress and two Lembert sutures of the same material. Two large cigarette drains were laid through lower angle of incision to bottom of pelvis. No drain laid to site of perforation. Wound closed with catgut.

Patient was returned to bed; placed in upright position; continuous salt solution per rectum was started. The day following the operation the patient was allowed water in small quantities; dressings were changed frequently, well soaked. By the third day the drainage was clear but still large in amount. On fourth day patient was taken down from the upright position, and as the drainage had become much less in amount, one drain was removed from pelvis, second drain being removed day following. Patient's bowels were moving frequently, the salt solution acting as a low enema, and on the fifth day the administration of salt solution per rectum was stopped. Patient's condition after operation good; very little pain; no distention; pulse falling gradually; temperature running irregularly—at no time over 102.6° F. By July 27, one week after operation, patient was taking same diet as before operation. Sponge baths were resumed and the course of the disease was from that time on a typical typhoid convalescence. Patient was discharged on Sept. 16, temperature having been normal for almost a month; abdominal wound entirely healed.

An interesting point in this case was the fact that on account of slight hemorrhage on July 19, the patient had received nothing by mouth but water in small quantities for forty-eight hours prior to perforation. The early age of this patient (8½ years) is also of interest. It may be worthy of note that this patient had been ill at home for three or four weeks before coming to the hospital, and during this time had probably eaten without restriction.

Case II.—H. E.; male; white; aged 38 years. Admitted to the hospital Aug. 18, with typhoid fever. Course of disease uneventful except for severe cough which bothered patient considerably. Aug. 24, 3.00 A.M., patient expelled a great deal of flatus. At 5.30 A.M. he received an enema, 500 c.c. of soap suds, which was expelled with a great deal of flatus and a large fluid stool consisting for the most part of dark blood. From that time until noon patient was very comfortable. At noon he began to complain of sharp pain in lower abdomen. Abdomen was examined and found flat; liver dulness normal; tenderness was elicited only on deep pressure above symphysis and in inguinal regions. The pain was of the same character as that usually seen with a distended bladder. The character of the pain, its situation, the negative result of abdominal examination, and the fact that the patient, who up to this time had been voiding large

amounts at intervals of thirty minutes, had not voided at all for one and a half hours, made it seem probable that the whole disturbance might be due to a distended bladder, though no bladder tumor could be made out. Hot-water bag was applied to lower abdomen and patient immediately went to sleep. One and a half hours later patient awoke and complained of abdominal pain of the same character as before. As he had not voided for four hours, he was catheterized, 300 c.c. of urine being obtained. He immediately became comfortable and remained quiet for one and a half hours. At the end of that time he complained again of pain as before, but examination was again negative. Patient was very much frightened, complained of tenderness wherever touched, all tenderness, however, disappearing whenever he regained his composure. At 6.00 P.M. patient had become much quieter and a much more satisfactory examination could be carried out. At this time tenderness could be made out over whole lower abdomen on light pressure. Abdomen was not at all distended, its walls were rigid; but this point was of no assistance as patient had persistently held his abdominal walls rigidly ever since admission. The liver dulness, however, had entirely disappeared. Pulse was fourteen beats higher than it had been for two days; temperature 103.5° F., which was slightly higher than it had been for several days past. On examination of the chest there were practically no breath sounds to be heard on left side. Percussion note was normal; leucocytes were 7500 in the A.M., the same in the P.M. Diagnosis of perforation was made, the absence of liver dulness with an abdomen not at all distended pointing definitely to the presence of free gas in the peritoneal cavity.

As soon as the consent of the patient's wife could be obtained, patient was taken to the operating room, eight hours after the first symptom of perforation had been observed.

Operation.—Anæsthetic: ether. Time of operation: forty minutes. Low right rectus incision. Peritoneum incised, allowing escape of yellow fluid and some gas. Cæcum located and ileum followed up from that point. About one foot above the cæcum were found four perforations; the first one oozing, the second large enough to admit a thumb, and freely draining intestinal contents. The two perforations above this one were both oozing yellow fluid and gas. The portion of gut containing perforations measured about eight inches. The peritoneal cavity was

full of cloudy, brownish fluid and fecal material; the intestines everywhere red and injected. The three small perforations were closed with purse-string sutures of fine black silk, reinforced by mattress sutures of the same material. It was impossible to close the largest perforation because its closure would have encroached too markedly on the lumen of the gut. The intestine at the site of this perforation was drawn into the wound and packed around with iodoform gauze. The edges of the perforation were then sutured to the edges of the parietal peritoneum, the sutures passing through the gauze packing. A very small iodoform drain, reaching to the perforations situated above, was laid in the lower angle of the wound. A suprapubic incision was now made in the mid-line and through it two large cigarette drains and one rubber tube were laid to the bottom of the pelvis.

Patient returned to ward greatly shocked; was put to bed in the upright position; and the continuous administration of salt solution by rectum begun. Enterostomy was draining freely and as soon as patient recovered sufficiently, he was allowed full liquid diet. His condition for thirty-six hours after operation was extremely grave, but improved progressively on no other stimulation than salt solution and coffee per rectum. Two days after operation respiratory distress became marked, the frequency varying from twenty-eight to thirty-six per minute. Examination of chest showed a tympanitic note throughout left side with an entire absence of breath sounds. Cough was constant and expectoration free. When patient left the hospital, several months later, the left side of chest was still tympanitic and no breath sounds could be heard except at extreme upper portions; but this condition seemed not to embarrass the patient in the least. By the end of the first week condition had improved very much. All the original drains had been removed, and, except from the enterostomy itself, there was but little drainage of any sort.

In this case salt solution and coffee after the third day were administered in small quantities at intervals of three hours, the patient not having been able, after the third day, to retain the fluid when given continuously. Owing to the excoriation of the skin by the drainage from the enterostomy, the patient was placed in a continuous tub on the twelfth day and kept there for two weeks. Temperature was normal from the time he was placed in the tub. Several weeks later there was some rise of temperature

due to numerous large abscesses over back and buttocks, but aside from this, patient's convalescence was uninterrupted. Three weeks after operation patient was taking solid food. Two months after perforation abdominal wounds had healed with the exception of a small fecal fistula at the site of enterostomy. Nov. 28, at a second operation, about six inches of gut were excised and a lateral anastomosis was done. Patient made uninterrupted recovery and went home on Jan. 4, 140 days after admission.

In this case we are confronted by the question as to the method of procedure in dealing with a perforation which cannot be closed, either on account of the friable condition of the edges or on account of its large size. The gut wall around the opening in this case was extremely friable; but even had it held, the lumen of the gut would have been so narrowed that obstruction would have been inevitable. The ideal method, and that usually advised, would be, then and there, to excise a portion of gut and to make an anastomosis. It seemed, however, in view of the grave condition of the patient and in view of the presence of a fierce general peritonitis, that the establishment of an enterostomy, while less desirable from many points of view than the procedure above referred to, was here the operation to be chosen.

CASE III.—P. H.; female; aged 6 years. Patient admitted to the hospital with typhoid fever Aug. 21, 1908. Disease ran a typical course for a week after admission. Aug. 29, eight days after admission, 1.30 A.M., patient awoke complaining of pain in abdomen, but immediately went to sleep again. She was, however, awakened a few minutes later during the course of an abdominal examination. At this time there was no distention of abdomen, liver dulness reached costal margin. There was slight tenderness and slight resistance to deep palpation on right side. Leucocytes were 13,500 (12,000 two days previously). On conclusion of examination patient went to sleep and slept unbrokenly for three hours. At the end of this time she again awoke crying with pain in both sides of abdomen. Second examination showed abdomen to be slightly fuller, though not markedly distended. There was general tenderness on pressure, especially on the right side, where there was also definite rigidity. Liver dulness was not diminished; leucocytes 14,000. Diagnosis of perforation was made and as soon as the consent of the family could be obtained patient was taken to operating room, seven hours after the second attack of pain.

Operation.—Anæsthetic: ether. Time of operation: thirty minutes. Low right rectus incision; peritoneum incised; omentum presenting in wound appeared red and injected. There was, however, no free fluid seen, and no evidence of gas escaping from the intestine. On pushing back the omentum there was noticed the escape of bubbling, yellowish fluid. Cæcum was located, ileum followed up, and small perforation leaking intestinal contents found about one foot above cæcum. Perforation closed with purse-string suture of fine black silk, reinforced by mattress sutures of the same material. Two cigarette drains were laid to the bottom of the pelvis through the lower angle of the incision. One small strip of iodoform gauze was placed in the direction of the perforation. Incision closed with catgut. Patient was put to bed in the upright position. Continuous administration of salt solution per rectum was started. Liquid diet allowed on recovering consciousness. Condition from the first improved rapidly; temperature two weeks after operation dropped to normal and stayed there. About one week after operation the perforation apparently reopened, at least in part, and for a week there was a slight fecal discharge. This, however, ceased spontaneously, and recovery was otherwise uneventful. Patient left the hospital on the fifty-fifth day, sinus having been closed for several weeks.

It is interesting to note that in this case the liver dulness remained undiminished in spite of perforation in the intestine. This, however, was explained at operation, when it was found that the perforation was loosely covered by omentum. This case showed better than any other the intermittent or paroxysmal character of the pain as seen after perforation of a typhoid ulcer, the patient having slept unbrokenly for three hours after her first complaint. Perforation in typhoid fever at this age (six years) is rare.

In following out this line of treatment, there was not noted a single sign or symptom indicative of a bad effect on the course of the typhoid fever. On the other hand there was a very rapid subsidence of the peritonitis and a more rapid return to normal temperature and the stage of convalescence than was observed in the majority of our cases of typhoid uncomplicated by perforation.

CASE IV.—T. H.; male; white; aged 12 years. This case came in with typhoid fever in about the second week of the disease. Course of the disease after admission was moderately severe. Patient complained frequently of abdominal pain after taking nourishment. There was nothing, however, abnormal made out any time on examination and most of the complaints were, after a time, put down to a grumbling disposition.

On Sept. 6, after having been comfortable all morning, sleeping part of the time, the patient awoke at 1.00 P.M., complaining of intense abdominal pain. He was seen immediately and his complaints were more marked than those of any of the cases reported thus far. Pulse had not risen; respirations, however, were thirty. On account of the restlessness of the patient it was impossible to have a temperature taken. Abdomen was distended and held absolutely rigid all through. Liver dulness was completely obliterated. A half-hour after the first complaint, pulse had risen sixteen beats. An hour after patient had begun to complain, the pain apparently abated and patient went to sleep. Patient vomited once before operation. As soon as consent could be gained, patient was taken to the operating room, three hours after pain was first complained of.

Operation.—Anæsthetic: ether. Time of operation: thirty minutes. Right rectus incision at the level of umbilicus. As the peritoneum was incised, a straw-colored fluid gushed out to the height of six or seven inches. Peritoneal cavity was found full of fluid with some solid particles of fecal material. Intestines were everywhere red and injected. Cæcum was located, ileum followed up, and a large perforation found about one foot above cæcum. This perforation was closed with difficulty, as it was situated in the centre of a large ulcerated area and the edges were very friable. Closure was done by purse-string suture of fine black silk, reinforced by several mattress sutures of the same material. This, it was found, had constricted to some extent the lumen of the gut; but the tip of one's finger could be passed through. Two cigarette drains with a rubber tube between them were laid through lower angle of incision to bottom of pelvis. One small strip of iodoform gauze was laid in the direction of the perforation. Closure with catgut.

Patient was put back to bed in the upright position and given continuous salt solution per rectum. Condition of patient after

operation improved—pain, tenderness, and rigidity quickly disappearing. Temperature remained up, but pulse came down to same rate as before operation.

Liquid nourishment was started. Drainage from wound was profuse and drains were started early. On the sixth day after operation abdomen became very much distended; no movement of bowels could be induced; temperature jumped up to 106°, pulse to 180. Abdominal distention was so great that a loop of distended gut presented alongside of the drains in lower angle of incision. An intestinal obstruction was diagnosed (this having been feared at time of operation on account of encroachment of lumen of gut by closure of perforation); an opening was made with a cautery in the wall of the distended loop of gut presenting in wound, and the abdominal condition was promptly relieved.

Patient's general condition improved slowly for a few days, after which improvement was more rapid. There was, however, one other attack of obstruction on the thirty-fourth day after operation, which was relieved by enemata given through enterostomy wound, accompanied by vigorous abdominal massage. Aside from this the convalescence was uninterrupted, though somewhat delayed by the presence of a deep bed-sore occupying the sacral region. The temperature of patient had not reached normal until the forty-sixth day after operation. He was discharged on the sixty-third day with a small fecal fistula. Two weeks later the patient was seen, and by that time the fistula had closed entirely.

This patient was a brother of the little girl whose case was reported immediately before this (Case III). There were in the hospital at the same time four members of this family with typhoid fever. Two of them perforated, were operated upon, and recovered. A third was referred to above —a case of general peritonitis with no discoverable perforation. He was operated on at the same time as Case IV, and died the day following. The fourth member of the family had an uneventful attack of typhoid and recovered.

SPONTANEOUS RUPTURE OF THE SPLEEN IN THE COURSE OF TYPHOID FEVER.*

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THAT enlargement of the spleen to various degrees is constantly present in typhoid fever is well known clinically and emphasized by all text-books on internal medicine; but that the tension from within may be so great as spontaneously to overcome the thinned-out capsule and peritoneal investment is mentioned by comparatively few authors even as a possible complication of enteric fever. In looking over all available literature the writer finds that fourteen text-books on internal medicine do not mention spontaneous rupture of the spleen in the course of typhoid fever as even a possible complication. Four other text-books, however, state that it is possible and may occur.

OSLER ("Practice of Medicine," 6th edition) says, "The spleen is invariably enlarged, rupture may occur spontaneously or as the result of injury. In the Münich autopsies, 2000 in number, there were 5 instances of rupture of the spleen, one of these was caused by abscess." A letter from Dr. Osler to the writer, December 6, 1908, says, "There was no rupture of the spleen in our Johns Hopkins Hospital series. . . . I have often wondered why the organ did not rupture, I have seen it like a bag of molasses."

HERRICK[35] of Chicago says, "Spontaneous rupture of the spleen in typhoid fever seems to be extremely rare. No case has come under my notice nor do I remember to have heard of one in Chicago, where typhoid fever is not at all uncommon."

STENGEL[34] states his experience as practically that of Herrick's.

ANDERS ("Practice of Medicine") says, "Kern has searched the literature and found only 9 cases of abscesses. In rare cases, either spontaneously or as the result of injury, the spleen may rupture; and the records of 2000 post-mortem typhoids at the Münich Pathologic Institute furnish 5 cases."

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* Read before the Tri-State Medical Society of Virginia and the two Carolinas, at its annual meeting in Charleston, S. C., February 17, 1909:

BUTLER ("Diagnostics of Internal Medicine") believes that "in the excessive degree of hyperæmia sometimes present in typhoid, malaria, and other fevers, spontaneous rupture may occur; traumatism is a more common cause."

The following series of reported cases of spontaneous rupture of the spleen in the course of typhoid fever have been collected * for the writer and are believed to be complete to the present time.

CASE I.—AASER[1] reports a case of rupture of the spleen following typhoid fever. Man, aged 20 years. Attack of typhoid fever running a two-weeks' course. Admitted to hospital and died one-half hour later. Autopsy, rupture of the spleen so great that a portion of the organ was almost severed from the rest.

CASE II.—COLLIN[2] reports a case of rupture of the spleen in enteric fever. Man, aged 19 years. Chronic diarrhœa, abscess of right lung, general peritonitis. Death. Autopsy. All the viscera mutually adherent, false membranes mixed with blood. Spleen ruptured in three places; two were superficial, but the other long and situated at the posterior border of the organ. There was a depression of 6 cm. Spleen weighed 225 grammes. The parenchyma was brownish-black in color.

CASE III.—CRAIG[3] reports a case of rupture of the spleen. A soldier, aged 23 years. Illness began eight days before admission to hospital. Diagnosed on transport as intermittent malarial fever. Admitted. Headache, diarrhœa, and tympanitic abdomen. Blood negative for malaria. Typical course of typhoid fever. Great pain in left hypochondrium. Collapse. Death. Autopsy. Coils of intestines mutually adherent, gas, purulent exudate, appendix inflamed greatly. Spleen had large laceration through the capsule, 3 cm. in length; the organ measured 20 by 11 cm. dark reddish-purple. Upper section showed dark mahogany red. Malpighian corpuscles indistinct, much congested; rupture went into the substance of the organ. Typhoid lesions in other organs.

CASE IV.—DARWIN[4] reports a case of rupture of the spleen in fever (kind not stated). Man, aged (?); soldier in Indian Infantry. High fever and great pain in abdomen. Diarrhœa, fæces pale yellow; abdomen somewhat hard and resistent (evidently typhoid). Death. Autopsy, seven hours after death. Green fluid escaped from the nose. Stomach distended, also intestines, coils adherent. Spleen adherent to abdominal walls, much enlarged. Capsule ruptured. Dark coagulating blood protruding.

CASE V.—ERICHSEN[5] reports a case of spontaneous rupture of the spleen in typhoid fever. Patient convalescent, when he suddenly fell backward and was dead. Autopsy. The spleen had a long rupture and

* By Dr. Carl H. Von Klein of Chicago and his staff of foreign correspondents.

the wrinkled capsule surrounded a confluent, livid-red parenchyma, in which there was no trace of the normal tissue. The rupture was near the hilum and was from 3 to 4 inches in length. Liver much enlarged.

CASE VI.—LIDELL[6] reports a case of spontaneous rupture of the spleen in typhoid fever. Woman, aged 25 years. Admitted to hospital on Ward's Island (1849). "Ship fever." Had been ill three days. Usual symptoms of sudden internal hemorrhage. Death in one hour. Autopsy sixty-six hours after death. Peritoneal cavity contained 90 ounces of extravasated blood, 40 ounces of it firmly coagulated. Came from ruptured spleen. Peritoneal coat torn through. Splenic parenchyma soft and chocolate color. No injury and the rupture must have been spontaneous.

CASE VII.—NÜCKEL.[7] Man, aged 25 years. Fever with pain in the lower abdomen. Death. Autopsy forty-eight hours after death. Blood extravasation from the left hypochondrium to the entrance of the small pelvis. Was coagulated in large clots. Spleen ruptured in an angle-shaped tear. Spleen 5 by 4 inches. The surrounding fasciæ were so degenerated that they tore when touched.

CASE VIII.—PETERSON.[8] Man, aged 36 years. Soldier five days ill with typhoid fever. Great pain in lower abdomen. Death. Autopsy. Lungs œdematous, peritoneum injected. Spleen 17 by 8 by 4 cm. Yellow infarct size of hazelnut, convex surface ruptured.

CASE IX.—PETERSON.[8] Man, aged 21 years; attack of intermittent typhoid fever. Spleen region sensitive. Cyanosis. Death. Autopsy. Spleen much enlarged, particularly in longitude. Ruptured at both ends radiating to the capsule.

CASE X.—PETERSON.[8] Man, cigar-maker, great perspiration, attack of fever. Great pain in lower abdomen. Exudate in abdominal cavity. Death. Autopsy. Heart, liver, and kidneys showed parenchymatous degeneration; 1½ lbs. of pus in abdominal cavity. Spleen 16 by 11 by 5 cm. Ruptured on lateral end.

CASE XI.—PETERSON.[8] Man, aged 26 years; 17 days in hospital, typhoid fever. Vomiting, collapse, death. Autopsy. Heart lax and anæmic. Thick dark-brown blood in abdominal cavity. Peritoneum slightly injected. Intestinal walls suffused. Omentum thick. Spleen 19 by 13 by 3 cm., attached to the ventricular fundus. Rupture on lower lateral end.

CASE XII.—PETERSON.[8] Woman, aged 39 years; factory worker. Fever, delirium, vomiting, icterus, and death. Autopsy. Lungs œdematous and left pleura somewhat fibrinous. Spleen 16 by 11 by 6 cm., a row of infarcts seen through the capsule. Rupture of stomach portion.

CASE XIII.—PETERSON.[8] Boy, aged 11 years; factory worker. Intermittent typhoid. Death. Rupture of the spleen in part in the stomach.

CASE XIV.—PETERSON.[8] Man, aged 28 years; severe case of typhoid fever, death. Autopsy. Concretion of pus size of hen's egg in upper lobe of left lung. Heart degenerated. Spleen 19 by 14 by 5 cm., three ruptures on forward border with irregular broken edges.

CASE XV.—SANTI[9] reports a case of spontaneous rupture of the spleen in typhus. Patient, aged 20 years, complained of pain in the left hypochondriac region, particularly near the spleen. Left leg and foot swollen,

owing no doubt to a venous thrombus. Typhus diarrhœa, condition serious. Entrance to hospital, fifty days later seemed to be improved. Temperature 38° C. Later felt violent pains in left side, involving the entire abdomen. Death in a few hours. Autopsy. Spleen much enlarged, jelly-like in substance; exudation of purulent matter into peritoneum. Recent discolorations. Two round ulcers in the abdomen; recent discoloration in the right kidney. Rupture of the splenic capsule no doubt due to recent and prior embolism.

CASE XVI.—SWAVING.[16] Spontaneous rupture of the spleen. Man, aged 35 years, Chinese; malignant typhoid. Enlarged spleen and liver. Ran a course of four days. Death. Autopsy. Thin, serous, bloody fluid in the abdominal cavity. Large black lump of blood covered entire spleen and part of the stomach. Liver hypertrophied. Spleen 20 by 10 by 7, weight 6 lbs. Diagnosed rupture, 2 inches in length and 1 inch deep. Pulp in the tear, a red-brown mass, vessels empty. Spleen solid substance. All the other organs (except liver and spleen) were empty of blood.

CASE XVII.—HEIMANN[10] reports a case in which the extension of the spleen was so remarkable that the organ ruptured and the jelly-like substance emptied into the abdominal cavity. It was full of whitish-yellow spots.

CASE XVIII.—WITTMANN[17] reports a case of rupture of the spleen in typhoid fever. Boy, aged 10 years, healthy, well-built child. Attack of typhoid fever. Skin hot and dry. Rapid respiration and cough. Strong pulse, 120. The splenic dulness began on the lower border of the eighth rib and lapped the last false rib. Patient somnolent and half delirious, great thirst. Death. Postmortem. The stomach contained great quantity of "coffee-colored" fluid. Liver pale and gall-bladder almost empty. Spleen much enlarged; 2½ inch rupture, beginning at the spleen entrance and ending on the upper surface.

CASE XIX.—GRIESINGER[11] describes a case of rupture of the spleen in typhoid fever. Patient in delirium jumped out of the window. Death twenty-four hours later. Autopsy revealed, in addition to other injuries, a rupture of the spleen in three different places. There was a slight extravasation of blood.

CASE XX.—WEST and DUDDING[18] report a very rare case of typhoid fever complicated with spontaneous rupture of the spleen. Man, soldier, aged (?). Headache of two days. Abdomen slightly full, but not marked enlargement of spleen. Temperature rose above 103°, a few rose spots on abdomen on third day. Abdominal pain, pulse weak and rapid. Perforation suspected. Operation. Blood in lower abdomen and intestines floated upward, collapse and wound closed. Death. Necropsy. Spleen enlarged and ruptured three inches on diaphragmatic surface. Weighed 2 lbs. and 2½ ounces, capsule separated by clot. Duration of disease eight days.

CASE XXI.—CHROSTOWKI.[12] Patient, blacksmith, aged 27 years, who was sick for several days before a physician was consulted. He was delirious and when the physician arrived he found the temperature 40.3° C., pulse over 100, respiration 24 to the minute. On the second day the patient

became very delirious, desperately attempting to get out of bed. The slightest touch on the left side in the region of the spleen seemed to him the pangs of death; often signing and pointing to the region of the spleen. Temperature 39.4° C., pulse 126, respiration 40, nose and ears cold and cyanotic. The abdomen was enormously enlarged. Ice compresses were applied over the abdomen, he became thoroughly unconscious about 3 o'clock the next morning and died at 7 o'clock the same day. Postmortem revealed the spleen to be six times the usual size, the outside being covered with thick dark blood; and when the blood was removed it revealed a vertical rupture of the spleen from 8 to 10 cm. long. The splenic artery was also torn.

CASE XXII.—CHROSTOWKI.[12] Patient, 18 years old, typhoid fever; was six days in bed before going to the hospital. Temperature 40.5° C., respiration 24. He continued in the same condition up to the tenth day at the hospital, which was considered good, notwithstanding that he lost a great deal of strength. About the sixteenth day in the hospital he became delirious, the temperature being 38° C. in the morning to 40.4° C., pulse 126. Next day the temperature fell to 37.6° C., pulse 100, respiration 28. Patient seemed to feel better, but on the eighteenth day he died at 6 o'clock. Postmortem revealed a rupture of the spleen 3 cm. long. The spleen was found considerably enlarged, was surrounded with thick coagulated blood, and the splenic artery torn. The spleen was removed, and upon examination internally it was found that the pulp of the spleen was also ruptured and filled with thick coagulated blood.

CASE XXIII.—DELAFIELD.[10] Typhoid fever, rupture of spleen. Boy, 8 years old; two weeks ago caught cold; seized with cough, fever, coffee-ground sputa, a little pain in the right side of the chest. Worse every afternoon. No diarrhœa or epistaxis. Tongue clean; pulse 100, temperature 99¾°; bowels regular; urine 1010, no albumin. Coarse râles over both lungs.

October 29, pulse 100–112, temperature 99¾°–102¼°.
October 30, pulse 114–122, temperature 100° –103½°.
October 31, pulse 104, temperature 100¼°.
November 1, pulse 96–120, temperature 99° – 98½.
November 2, pulse 98–120, temperature 99° – 98½°.
November 3, has been improving, to-day sat up.
November 7, complains of weakness, stays in bed.
November 10, suddenly much worse.
2 P.M., pulse 145, temperature 104¼°.
8 P.M., pulse 144, temperature 105½°.

November 11, 2.30 A.M., was found in the hall dying. Died 3 A.M.

Autopsy, November 11, 2.30 P.M.—Brain, slight increase of serum beneath; heart, normal, not softened; lungs, moderate bronchitis; liver, normal.

Spleen, 14 ounces, a very large rupture extending all around it at its middle. In the peritoneal cavity a large amount of blood. Large intestine normal. Along entire length of ileum, solitary and agminated glands very

much swollen and a very few of them ulcerated. Small nodules in mucous membrane. Mesenteric glands very much swollen.

CASE XXIV.—AFANASSJEFF[13] relates a case of rupture of the spleen in typhoid fever. Patient a medical student, aged 24, weighing 148½ pounds. Diagnosed at first some form of intermittent fever. He complained of great deal of pain in left side with a temperature of 40° C. The high temperature indicated a case of infection and was pronounced typhoid fever. The patient constantly complained of severe pain on the left side and of being unable to lie on that side. The spleen could be felt to enlarge daily. Quinine was administered for twenty-three days, when it was noticed that the enlargement of the spleen extended below the ribs more than three inches wide, very painful to the touch, showing that suppuration had taken place. Dr. Pineck, the consulting physician, introduced in several places an exploring needle, between the lower ribs in the axillary line, but no pus was obtainable. He later for the second time introduced an exploring needle with some success in bringing pus, which was passed under the microscope and found to contain suppurative matter. An incision was made below the lower rib in the axillary line of the extended part, bringing forth a large volume of pus mixed with blood. A digital examination was made, the finger found its way to rupture of the spleen. The spleen was treated accordingly, and owing to the vitality of the patient he recovered.

To these I now add another case, as follows:

CASE XXV.—BRYAN. Mr. L. M. S., aged 31, married, blacksmith, Dry Creek, W. Va., having always enjoyed good health, Saturday, October 31, 1908, came home from work, stating that he had felt badly all the week. Dr. O. F. Richter was called in, temperature at 3 P.M. was $103^{4}/_{5}°$, patient complained of headache and nose bleed. Sunday, November 1, temperature at 11 A.M. was $103^{3}/_{5}°$; hospital recommended. Monday, November 2, temperature at 6 A.M., $103^{1}/_{5}°$; patient sent to the Virginia Hospital, Richmond, Va., 200 miles distant.

November 2, 5 P.M. on admission, a well-developed muscular man, height 5 ft. 10 in., weight 175. For a week past has had fever; complains now of slight headache and a moderate pain in the left side under the ribs. No significance was attached to this pain at the time, it being supposed to be muscular or from some strain in transportation. The tongue was coated and furred, cheeks flushed, abdomen moderately distended and tympanitic, the spleen not felt, some few rose spots.

The course of the patient's temperature, although very high during the succeeding two weeks, responded readily to the alcohol

rub. In lucid intervals, at times he complained of an indefinite pain in the abdomen, while at other times it was referred to the left thigh and knee. When questioned more closely the true location and severity could not be determined. He was constantly under the attendance of a day and night nurse. The alcohol rubs were given on woollen blankets upon which he was gently rolled, every four hours, the temperature exceeding 103° F. The diazo reaction was positive on each examination. The patient was never violent nor out of bed, nor assumed the sitting posture. No physical examination was made of the spleen other than daily inspection and superficial palpations of the abdomen. The nourishment was liquid. The bowels moved daily. The temperature was taken by rectum except when otherwise stated.

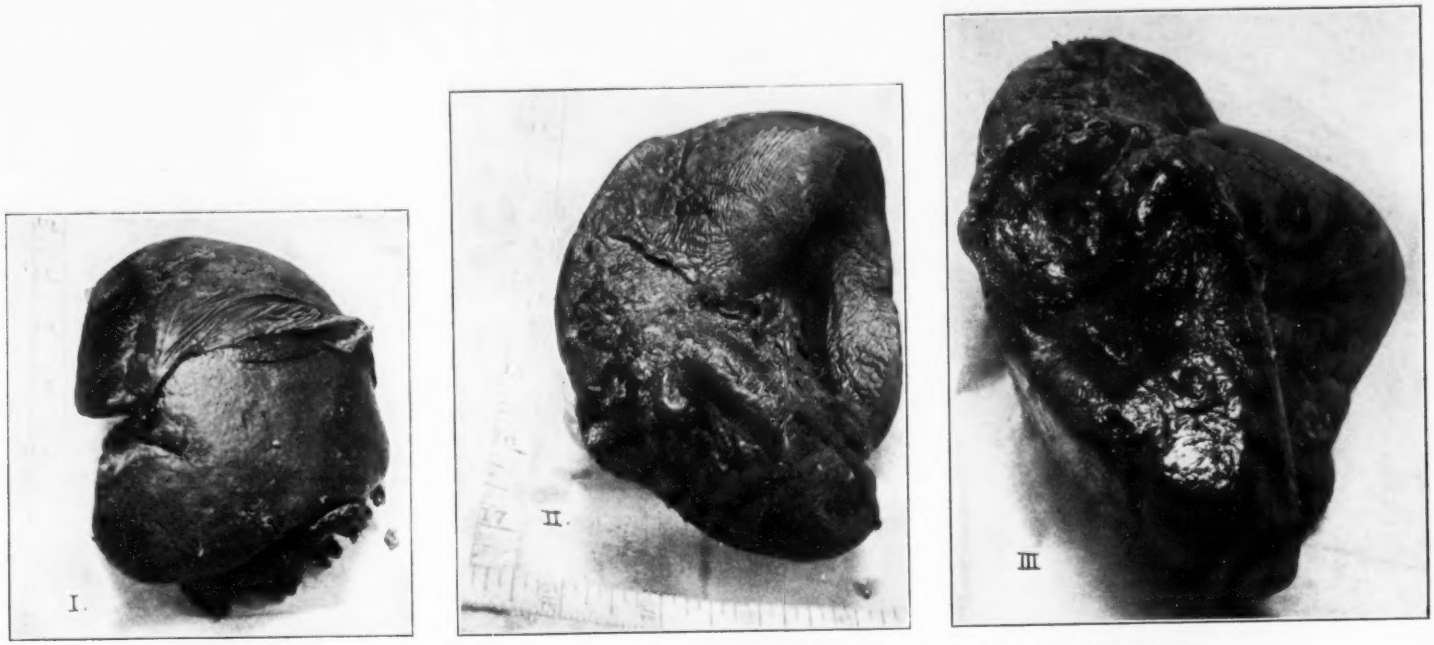
SUNDAY, NOVEMBER 14.

	Temperature.	Pulse.	Respiration.
4 A.M.	104⅖°	116	22
Rectal (after alcohol rub)	103⅕°	88	20
8 A.M.	104⅕°	96	26
Rectal (after alcohol rub)	102⅗°	92	20
12	104⅗°	96	28
Rectal (after alcohol rub)	104⅕°	92	28
4 P.M.	105°	110	30
Rectal (after alcohol rub)	104⅕°	92	28
8 P.M.	105⅘°	136	28
Rectal (after alcohol rub)	104⅘°	130	30

The writer was called and at 8.30 P.M. found the temperature, by axilla, 106°, pulse 138, respiration 36.

The face was pinched, nose and extremities cold, moderate dyspnœa. The pulse was rapid, weak, running, but regular. The belly hard, resistant, and tympanitic, but not distended; knees extended. There was no absence of the liver dulness. Diagnosis: Perforation and hemorrhage.

The hyperpyrexia could not be accounted for. The patient was carried immediately to the operating room; and under ethyl-chloride and ether narcosis, which was intermittently administered, an incision 15 cm. in length along the outer border of the right rectus muscle was made. The intestines were turned out on hot pads and a systematic search made for the perforation. None was found. Moderately thickened Peyer's patches were evident here and there. Enlargement of some mesenteric glands



Ruptured spleen, size 7 x 3½ inches. Site of rupture, inferior pole. I. Anterior view. II. Inner view. III. End view.

was noticed. During the progress of evisceration quantities of blood would now and then well up into the wound. A gauze sponge carried down to the pelvis was saturated with blood and a few clots. The incision was now extended further down, and the pelvis found to be filled with about 10 to 15 ounces of dark tarry blood with few coagula. This was removed but rapidly reaccumulated. Infusion into the left median basilic ordered, 30 ounces normal saline.

The peritoneum was normal. There was considerable ballooning of the sigmoid. The iliac veins were supposed to be the source of hemorrhage, but were found normal. The spleen being suggested as the possible source of the hemorrhage the operator ran his hand upward, to feel a soft, pulpy, enlarged, and movable tumor, from about which large quantities of blood, blood-clots, and splenic pulp were raked away. The incision was now rapidly carried upward and toward the middle line within a few cm. of the xiphoid cartilage. The spleen was turned out on the belly wall; there were no adhesions; its pedicle was clamped, transfixed and cut, and the organ removed.

Infusion of normal saline again ordered, patient taking up about 50 ounces. Blood clots, coagula, and splenic pulp were wiped away; the peritoneal cavity filled with a quart of hot saline solution; the wound rapidly brought together by through-and-through sutures of silkworm gut. Despite succeeding measures to combat the shock and loss of blood, the patient died in one hour. No autopsy was allowed. The spleen measured 18 by 9 cm. and weighed $14^{2}/_{3}$ ounces.

The rupture was at the lower pole, stellate, everted, crater-like, from which small masses of splenic pulp were dangling. The organ was soft, pliable, pulpy, of a dark blue to blackish color. The capsule had been torn across at the site of the rupture and had retracted upward anteriorly and posteriorly as high as the hilum. The normal contour and shape of the spleen were evident. It is impossible to say, in the haste of the operation, how much blood was found in the abdominal cavity, probably one quart or more.

The writer is indebted to Dr. E. G. Hopkins, pathologist of the Virginia Hospital, for the following pathological findings:

"The tear extends 16 mm. into the substance of the organ and occupies an area of 22 by 38 mm. on the surface.

"The tissue surrounding this lesion is markedly hyperæmic and presents numerous areas of extravasated blood. Considerable areas consisting of large pale, partially necrotic cells are abundant in the splenic pulp, the Malpighian bodies being practically normal. A mural thrombus was found in one of the veins. Groups of bacilli are present in the blood-vessels and scattered throughout the sections."

The following cases recorded as spontaneous ruptures of the spleen by their respective authors should also be reported. It seems most improbable, however, that a ruptured spleen in the course of typhoid would go on to recovery without operative intervention.

CASE XXVI.—KERNIG[20] reports a case of spontaneous rupture of the spleen in typhus. Man, aged (?); healthy, strong. Attack of typhus exanthematicus. Fourteen days of convalescence and then four (not lasting) feverish attacks. At each slight attack the spleen increased in size; after the last one the organ was much enlarged. Vomiting and pain low in the epigastrium; collapse; and death feared. Abdomen distended. From the arch of the ribs to the os pubis was a large swelling. No sensitiveness on pressure. Disappearance after thirteen days. Beginning of pneumonia and then recovery. Diagnosis: rupture of the spleen, possibly through an infarct.

CASE XXVII.—STEUDEL[21] reports a case of rupture (?) of the spleen in typhus fever. Man, aged 28 years. Officer, returned from East Africa. Had had malarial fever and on return had attack of typhus fever. A spleen tumor was suspected but could not be symptomically defined. Recovery. Probably a rupture of the spleen or diaphragm. In this case (a strong young man) a rupture of the diaphragm was the least likely, so undoubtedly the rupture was of the spleen.

CASE XXVIII.—HARTLE[22] reports a case of rupture of the spleen in typhus fever. Boy, aged 13 years. Attack of intermittent typhoid fever. Spleen abnormally swollen so that the border overlapped the umbilicus. It felt like an enormous bladder filled with water. Destroyed the functions of the chylopoietic viscera. Convulsions; pulse could not be felt. Abdomen had been soft and lax, but was now much distended. Spleen probably ruptured and contents escaped into abdominal cavity. Recovery.

The one instance of splenectomy reported during the course of typhoid fever is that of (Ashby[23]) Case XXIX. A case of wandering spleen in typhoid fever. Patient woman aged 22 years. Large mass in left inguinal region. Temperature

104°; pus tumor suspected. Laparotomy. Enlarged spleen wedged in pelvis. Pedicle, 8 inches long, was ligated and spleen removed. Other organs normal. Typical typhoid course. Was a malarial spleen, contracted in a malarial section of the country. Recovery.

In this instance despite the high temperature and typhoid condition an enlarged, unruptured, wandering, malarial spleen was successfully removed. A letter from Dr. Ashby to the writer, January 9, 1909, says, " The temperature chart showed a most erratic course, as her temperature would jump from 98½° to 106° and rise and fall in the most eccentric manner. The patient had atypical typhoid fever, which did not show up until after her spleen was removed. The spleen was impacted in her pelvis. She made a perfect recovery and five years after the operation she was in perfect health, had married, given birth to a child, and had gained 20 pounds in weight. I regret that I cannot give you further data."

Carstens [37] reports 122 ruptures of the spleen from hypertrophy or injury, with 83 recoveries and 39 deaths.

Rupture of the spleen in the course of malarial fever is not uncommon; many cases have been reported. It is not the writer's intention to take up the many other causes of rupture of the spleen in parturition,[35] trauma, ecchinococcus, cystic degeneration, varices,[38] hypertrophy, following epistaxis,[39] abscesses,[24] malignant overgrowths, infarct, torsion; but suffice it to say that the removal of this organ (Carstens [37]) has been accomplished 739 times to January 1, 1905, with 521 recoveries and 197 deaths. Since then there have been many splenectomies performed and the operation for leucocythemic hypertrophy with its large death rate having been abandoned, the total mortality for splenectomy, 26 per cent., would be considerably lowered.

Anatomical Location of Spleen.—The normal area of spleen dulness is ovoidal in shape, its long axis corresponding to the direction of the ribs; and is found between the lower border of the eighth rib and the eleventh intercostal space, between the mid-scapular perpendicular posteriorly and the mid-

axillary perpendicular anteriorly. The normal spleen is palpated with great difficulty, if at all, by virtue of its covered position under the costal arch.

Etiology.—Adler [25] says regarding spontaneous rupture of the spleen in typhoid fever, that it has been demonstrated that the Eberth bacillus is found most often with the exception of the intestinal tumors and in the swollen mesentery glands) in the spleen. Numerous experiments and observations, therefore, have been made with culture of the juices of the ruptured spleen to decide a difficult case of diagnosis of abdominal typhus; and certainly the most solid proof we have of this " splenic toxæmia " is the great danger to life when the spleen ruptures.

Philipowicz [26] made examinations in four cases of abdominal typhus to discover the bacillus in the spleen. The spleen was punctured with the Pravaz syringe and the juice subjected to bacteriological investigation. Typhus colonies were found in great numbers. He concluded that this is the surest method for positive diagnosis.

In the laboratory Newhauss [27] performed experiments on rabbits and mice with the juice obtained by means of a Pravaz syringe from the enlarged spleen in the course of severe typhoid, his results being identical with Koch-Eberth bacillus of typhus abdominalis.

Laveran,[28] too, reports a case of typhoid with an examination for bacillus at the autopsy. Bacteriological examination of the splenic pulp grown in gelatin gave a perfect culture of Eberth's bacillus.

Hein also demonstrated this bacillus taken from the spleen.

Pathology.—Malinin [29] says that the spleen lacks the fibrous tissue to give it a structural foundation as well as certain lymphoid or round-shaped elements. All the firmness or consistency it possesses is in the characteristic spindle-shaped splenic cells: these are capable of extraordinary contraction and are attached to the neighboring cells; this gives the spleen construction. The strong permanent kernels of the splenic tissue have a lively amæboid movement, and form a

cavity in which all the dead cells, red and white, are taken out of the circulation. These degenerate and get into the circulation as white blood-corpuscles. The spleen cells form rapidly. In intermittent fever multitudes of the blood-cells are ruined and the splenic cell-kernels take up the ruins. This obtains in typhus (abdominalis).

Lidell,[6] concerning his case of spontaneous rupture of the spleen in typhoid fever, says that the causes of the rupture seem to be several: (1) Softening of all the structures of the organ, including coats of the blood-vessels. (2) Intense congestion of the portal vein and radicles; this often comes with the early stages of petechial typhus and malarial fevers. (3) Stagnating blood distending and pressing the soft walls of the blood-vessels in splenic surface; this forces blood between splenic tissue and capsule and invested peritoneum. (4) Blood increasing compresses the parenchyma on one side and dilates the capsule and peritoneum on the other. Possibly the spleen may have been previously weakened in some unknown manner.

Heimann[10] reports an epidemic of typhus in the Military Hospital, beginning in April, 1840. The numerous deaths gave opportunity to study the changes in the spleen. In many cases it was found to be enormously distended, sometimes more than three times the natural size; then the lower end reached the border of the pelvis; the substance was much attenuated and weakened.

Zimmermann[32] believes that in cases of typhus the swelling of the spleen never fails and there is a predisposition to rupture. Spontaneous rupture is rare, but the organ is ready to be ruptured by blow or fall or sudden movement of the body. It is a question whether all so-called "spontaneous" ruptures are not in this class. The period in which the organ reaches its greatest magnitude varies greatly, from the end of the first week to eighteen days.

Mosler[15] says that where there are pathological changes in the spleen a rupture may occur spontaneously, or may be brought about by traumatic influence. Spontaneous ruptures are the consequences of an acute and very rapid swelling or

extension of the organ. Rokitansky thinks it comes oftenest in typhoid fever and in intermittent fevers. In the latter cases it occurs in the period of the chill. Death usually follows in twenty-four hours.

Cantlie [30] explains spontaneous rupture of the spleen in pernicious or intermittent fever by the softening of the tissue and the adhesion of the organ to its visceral neighbors, the weakness and immobility predisposing to rupture.

Boinet [31] attributes spontaneous rupture to the same cause.

Wilson [33] thinks it most probably that in the so-called "spontaneous rupture" the exciting cause is an action of muscular pressure while the subject is turning or moving suddenly. He does not believe that the spleen ever ruptures without this impetus, however softened and coagulated it may be.

The size to which the spleen may enlarge is not so dependent upon the degree of intoxication as upon the resistant force of its enveloping capsule, and of its properitoneal and peritoneal investments. The restraining influence of this extraperitoneal connective tissue can be but little; the cross leaves of its fibres are readily stretched and separated; the organ crowds through the separation and is now held back by the peritoneal coat alone, which eventually, being unable to withstand the increased tension, gives way and decides the physiologic instant of spontaneous rupture.

FINDINGS BY AUTOPSY OF RUPTURED SPLEEN IN TYPHOID FEVER.

Weight of spleen...	Largest, 6 lbs., Case XVI. Smallest, 225 Gr., Case III.
Size of spleen	Largest, 20 by 10 by 7 cm., Case XVI. Smallest, 5 by 4 inches, Case VII.
Length of rupture..	Longest, organ almost severed, Case I. Shortest, 3 cm., Case III.
Number of ruptures	Three in Cases II, XIV, XIX. Two in Case IX. One in 20 Cases.
Depth of rupture...	Greatest, 6 cm., in Case II. Least, 2.5 cm., in Case XVI.
Shape of rupture...	Angle-shaped in Case VII. Irregular edges in Case XIV. Crater-like in Case XXV. Not mentioned in remaining cases.

Site of rupture.....	At or near the middle in Cases II, V, VIII, XII, XIV, XVIII, XX, XXI, XXIII. At or near the ends in Cases IX, X, XI, XXV. Not mentioned in remaining cases.
Rupture into neighboring organs	Stomach, Case XIII.
Amount of blood in peritoneal cavity	Greatest mentioned, 90 ounces, Case VI. Least mentioned, 1 quart, Case XXV.
Condition of spleen	Not mentioned in Cases I, VII, VIII, IX, X, XI, XII, XIII, XIV, XVIII, XIX, XX, XXI, XXII, XXIII. In remaining cases described as: Brownish-black, bluish-black, purplish; mahogany, chocolate, etc., etc.; pulpy, soft, pliable, etc.
Condition of splenic vessels	Splenic artery torn, Cases XXI, XXII.

Peterson [8] thinks that the median and convex part of the spleen are most exposed to danger of rupture of the capsule. It is here that the support is greater but the channels larger.

In three out of five cases reported by Cantlie [30] the rupture was near the hilum in the shape of a star, and in other cases of Cantlie's noted in Hong Kong the rupture was in each instance behind the hilum longitudinally and as if cut with a sharp knife.

Vigla [34] states that the form of rupture is linear or round and the quantity of extravasated blood usually very great.

Fatal termination seems to be the only outcome for rupture of the spleen, regardless of its size or depth, for if hemorrhage does not exsanguinate the poison overwhelms.

SYMPTOMS.—Vigla [34] says the usual symptoms are a pain in the splenic region, distention of the abdomen, and very often vomiting, small pulse, unconsciousness, with constitutional energy to the last. Death is the outcome.

The symptoms should be divided into (1) a preruptured period and (2) the postruptured period.

1. *Preruptured Period.*—Earlier in the disease the patient complains of the pain attendant upon the stretching of the capsule and investments, which is intermittent, not constant, of short duration, and lancinating. The tumor fills to various

degrees the left flank, its edge is not sharp but rounded, and feels soft or boggy. Blood-count is insignificant. The tumor is differentiated easily from the kidney. Later the hebetude, lethargy, and typhoid state, dependent upon the degree of intoxication and not upon the size of the spleen, are sufficiently overwhelming to allow no subjective signs. Intestinal disorders and tympany should follow from the splenic colon becoming angulated. What we bear constantly in mind is a large flabby tumor with an always weakening and thinning belt.

2. *Postruptured Period.*—This may be summed up in two words: (*a*) hemorrhage; (*b*) sepsis. The loss of blood is immediate and great. The tumor, if formerly much enlarged, is now smaller, irregular in outline, or may not be felt at all; the pulse is rapid, thready, and weak; the facies pinched and cold. There is air-hunger and restlessness. The delicate, highly organized, and multiple lymphatic channels in the rapidly-absorbing peritoneal roof and walls of the abdominal room are overwhelmed by the escaping poison from the spleen; and the temperature is high, 104°–107° F.; the patient complains of slight or no pain, the belly wall is hard and tympanitic, or flat in the flanks. There is no loss of liver dulness. Rectal examination is negative. The physiological moment of rupture is instantaneously signalized by shock, profound and progressing; and following rapidly, contrary to established rules in other surgical conditions of shock, there is a hyperpyrexia which so crushes the vital energy and remaining sparks of life that the treatment can be only surgical, immediate and radical.

The Treatment.—The patient should not be moved from the bed; an incision along the outer border of the left rectus allows easy access; clamping, tieing, and removal is a matter of only a short time. Large coagula, splenic pulp, and clots must be raked out of the pelvis and the hand run up under the diaphragm to remove any accumulation there. Infusion, autoinfusion, saline enema, the peritoneal cavity filled with normal salt solution, heart stimulants, and a moderate Fowler's posi-

tion with oxygen are the surgical procedures which should be tried as indicated.

A review of the foregoing shows twenty-eight reported cases of spontaneous rupture of the spleen in the course of typhoid fever, which with the unreported Münich cases, five in number, and Cantlie's five, make a sum total of thirty-eight cases. The condition was undiagnosed in every instance. In one (Case XXIV) aspiration of the splenic abscess was carried out successfully. In Case XX operation was performed for perforation, none was found; lineal rupture, the condition being unrecognized; the procedure abandoned, death. Case XXV, operation performed for perforation; ruptured spleen found and removed; death. In Case XXIX Ashby removed an enlarged unruptured malarial spleen in the course of typhoid fever. Recovery.

CONCLUSIONS.

1. That enlargement of the spleen to some degree is constantly associated with typhoid fever.

2. That splenic rupture in the course of typhoid fever occurs more frequently than is clinically recognized.

3. That many cases of lineal rupture have gone to death undiagnosed.

4. That many such cases have been diagnosed perforation and because of medical prejudice have been denied surgical help.

5. That it occurs most frequently in the beginning of the third week, and then during the actual stage of convalescence. This latter is probably explained by muscular effort.

6. That any reference to pain on the part of the patient under the left costal arch should put the attendant on his guard.

7. That the normal spleen cannot be palpated satisfactorily.

8. That the spleen does not have to assume great dimensions for spontaneous rupture (Case VII).

9. That the enlarged typhoid spleen should never be handled, but should be touched daily.

10. That marks upon the skin with the date at the end of the line would indicate the increase in size.

11. That in all cases of typhoid an ice-bag should be constantly applied to the spleen.

12. That in cases of enlarged spleen the patient should be bathed most gently and carefully.

13. That a sudden increase in the pulse-rate, 20 or 30 beats, at any time during the course of this disease, should be investigated thoroughly.

14. That if this increased pulse-rate is attended by evidence of shock (hemorrhage), the attendant should be notified instantly.

15. That if the liver dulness is not obscured, and a rapidly rising temperature soon sets in, rupture of the spleen is the tentative diagnosis.

16. That pain is an insignificant diagnostic sign of rupture.

17. That on diagnosis, infusion, and Fowler's position should be instituted immediately before operating.

18. That the use of adrenalin, ergot, and iron preparations would seem to be of little value.

19. That the only hope for recovery is in operation.

20. That in the course of operation for intestinal perforation the spleen should be gently palpated through the abdominal incision and, if like a bag of molasses, should be removed.

21. That all the grave complications of typhoid fever are essentially surgical.

22. That a typhoid state is no contra-indication for operation (Case XXIX).

23. That aspiration of the pus tumor can be carried out (Case XXIV).

24. That continuous peritoneal lavage with normal salt solution by means of two glass tubes, the giving one in the upper end of the incision (subdiaphragmatic) and the receiving tube a suprapubic stab, should be employed after removal of the organ.

25. That Roentgenography may be employed in suspected cases.

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ILEOCOLIC INTUSSUSCEPTION IN AN ADULT.

WITH REMARKS ON THE METHOD OF FORMATION AND GROWTH OF THIS VARIETY OF INTUSSUSCEPTION.

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ILEOCOLIC intussusceptions have hitherto been placed in a separate class from all other varieties on account of the different manner in which their growth is supposed to take place. It is commonly taught that it occurs as the result of prolapse of the ileum through the ileocæcal valve, that increase in length takes place entirely at the expense of the entering layer, and that consequently its apex is continually changing; this is an entirely opposite mode of growth to that which takes place in other varieties of intussusception.

To quote from a recent account written by the late Harold Barnard[1]: "In simple ileocolic intussusception the ileocæcal valve remains fixed whilst more and more ileum is prolapsed through its orifice into the cæcum." This is the generally accepted method of growth, of the curious nature of which no satisfactory explanation is forthcoming.

The following case illustrates what I believe to be the correct method of formation of ileocolic intussusceptions, bringing them into line with all other forms.

Woolf K., aged 30, was admitted into the London Hospital under my care on February 25, 1909. While at his work as a paperhanger, twenty-four hours before admission, he was suddenly seized with cramp in the lower abdomen. He vomited within a few minutes of the onset of the pain, and vomiting continued at frequent intervals. Two hours after the commencement of the illness he passed two loose stools, which, when cross-examined after his recovery, he stated were "red." Except for this, there was absolute constipation. The pain after the onset continued to be paroxysmal and cramping. He gave no history before operation of the passage of blood and no mucus

was passed. He looked ill, his face was pale, his eyes sunken, and he was groaning with pain. There was no doubt from his appearance that he was suffering from a severe abdominal lesion.

The abdominal wall moved fairly well, but there was slight rigidity in the right iliac region and an indefinite lump was present here. On examination per rectum, the rectovesical pouch appeared to be filled with fluid.

FIG. 1.

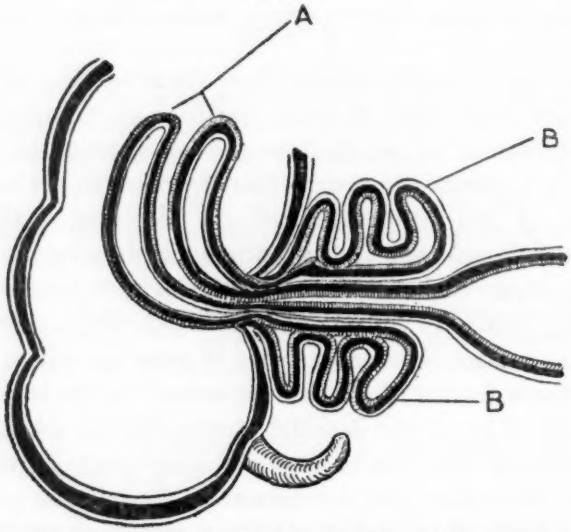

Diagram illustrates the condition found at operation. *A*, intussusceptum projecting into the cæcum through the ileocæcal valve. *B.B*, folded sheath of enteric intussusceptum.

It was obvious that he was suffering from acute intestinal obstruction, but I was unable to suggest its cause. I operated at once.

On opening the abdomen a considerable quantity of fluid escaped. Exploration revealed a mass in the ileocæcal region, evidently an intussusception. On bringing it outside I felt an elongated tumor in the cæcum. The ileum immediately internal to the cæcum was thrown into loose folds but the cæcal wall was not invaginated (*vide* Fig. 1). The condition was evidently an enteric intussusception in the process of passing through the ileocæcal valve. After squeezing its intussusceptum out through the ileocæcal valve, an ordinary enteric intussusception was left; this had started about a foot from the ileocæcal valve. I reduced it with considerable difficulty, and could find no cause for its commencement.

The patient made an uninterrupted recovery and left the hospital March 18.

But in addition to this mode of formation of an ileocolic intussusception as the result of the growth of an enteric, the condition may be primary and consist of the prolapse of part of the circumference of the ileum through the ileocæcal valve; but even in these cases no increase in size takes place at the expense of the entering layer, the ileocæcal valve, grasping the prolapsed ileum, passes on into the colon, forming a double intussusception. Special attention has been directed to the frequency of this form of intussusception by Corner [2] who named it "ileocolic-colic." In other cases the whole of the circumference of the ileum may be involved as the result of the unfolding of a small enteric intussusception just above the valve (Corner). In this form again no increase in size takes place, but it becomes an ileocolic-colic intussusception by involvement of the colon.

It is now over thirty years since Leichtenstern [3] described under the name "iliaca ileo colica" the variety of intussusception just recorded. He wrote of it thus: "A primary ileum invagination in the lower part of the ileum, which by its increase has passed its intussusceptum through the cæcal opening into the colon * * * * it cannot then be determined whether the invagination was primary ileocolic or iliaca ileo colica."

This does not seem to have received the notice it deserved, at any rate it has not obtained admission into the general surgical text-books in use in this country. It is mentioned in Sir Frederick Treves' monograph [4] and by Harold Barnard [5]; but these writers do not appear to have pointed out its bearing on the formation of ileocolic intussusception. Attention has recently been directed to this point by Fitzwilliams,[6] who, however, makes no mention of Leichtenstern's recognition of its occurrence.

The nomenclature of intussusception is still in a somewhat unsettled state. Undoubtedly the simplest and the best classification is that proposed by Cuthbert Wallace,[7] which I

have already advocated.[8] The term ileocæcal is confined to the variety of intussusception in which the apex of the intussusception is formed by the ileocæcal valve, and is dropped as the name of a class, the term enterocolic being employed.

The three groups are therefore: (1) enteric; (2) colic; (3) enterocolic.

The last named group, in which both small and large intestine are involved, is the most common, and contains many varieties of intussusception; the name ileocolic should be retained for one of these, remembering that it is a stage either in the growth of an enteric intussusception or in the evolution of an ileocolic-colic.

True ileocolic intussusceptions are uncommon. Out of 717 cases collected by Fitzwilliams[9] 67 were said to have been ileocolic. In the 45 cases upon which I have operated only 2 were ileocolic. The intussusception which starts as a small prolapse of the ileum into the colon and increases as a colic intussusception (ileocolic-colic) has been in my experience one of the most common forms of this disease.

To recapitulate: A complete ileocolic intussusception starts as the enteric variety. On reaching the ileocæcal valve the intussusceptum passes through, its apex as in other forms remaining unchanged. Further growth results in the colon participating, no fresh ileum is involved. When an ileocolic intussusception has been formed, whether as a small prolapse or as the result of the infolding of an enteric invagination, it does not increase in size by more ileum becoming prolapsed, but by the intussusception passing onwards in the colon and becoming ileocolic-colic.

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A VERY EARLY FORM OF RENAL TUBERCULOSIS REVEALED BY NEPHRECTOMY.*

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THE routine of cystoscopic examination and ureter catheterization has in turn led to the prompt recognition of tuberculosis of the kidney, and hence the *pium desiderium* for an early recognition of this condition. The force of this teaching has gathered strength in its onward march, and yet it is a common experience to find that what passes for an early recognition of the lesion clinically can hardly be considered such in the light of the extensive pathological changes in the kidney, found *in situ* at operation, and still more clearly upon its removal.

The case herewith reported shows that the reverse may exist, a full appreciation of which fact and the lesson to be learned therefrom will be best gathered from the history and sequence of events in the course of operation.

CASE.—The patient, M. S., No. 100,143, aged 41, was admitted to Mt. Sinai Hospital May 26, 1908, He claims that after an attack of gonorrhœa, five years ago, a frequency of urination persisted with pain and that he felt as if he never completely emptied his bladder. Ten months ago, for a presumed stricture of the neck of the bladder as explanatory of his condition, he submitted to an operation of perineal section and galvanocaustic division of the stricture (?). No relief followed the operation. Thereafter he states the frequency of urination at night occurred at half-hour intervals.

Examination.—The urine was smoky and interspersed with particles of blood-stained tissue. Microscopic examination showed the presence of leucocytes and some few tubercle bacilli, the urine reacting acid. External genitals were normal in size and not hypersensitive. The prostate was moderately enlarged and tender. The capacity of the bladder was short of 125 c.c.,

* Read before the American Urological Association, June 8, 1909.

and the introduction of the catheter and cystoscope alike painful.

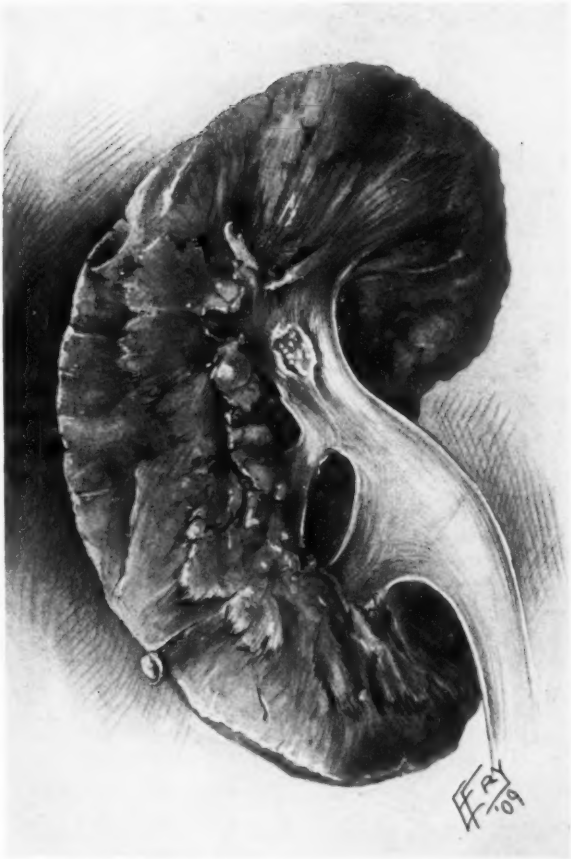
Cystoscopy (Nitze cystoscope).—Right ureter, normal slit with a slight submucous hemorrhage. The left half of the trigone markedly different. The left ureter golf-holed and an ulcer in its vicinity and the surrounding mucosa injected.

Chromocystoscopy.—Following the intramuscular injection of 4 c.c. of a 4 per cent. solution of indigo carmine, the urine, stained faintly blue, issued from the right ureter after eight minutes, but none escaped from the left ureter after an observation of twenty minutes.

Ureteral Catheterization.—The right ureter could be easily entered and the urine obtained was slightly blood-stained, acid, and contained no pus and no organisms. Urea, 2.3 per cent. The culture showed *Bacterium coli.* The left ureter could only be entered for a distance of 1.5 cm., whereupon an obstruction was encountered in the repeated attempts made with ureter catheter to pass by it; the quantity of urine, however, too small for analysis, showed the presence of tubercle bacilli. On culture, *Bacterium coli* and staphylococci were found. On the basis of these findings an exploratory operation was proposed and accepted.

Operation.—An oblique lumbar incision was made and the lower pole of the left kidney was found to be on a level with the last rib and the kidney rather securely placed under the costal arch. Numerous fine adhesions were manually severed to mobilize the kidney, which on its cortex appeared normal. Whilst in the act of grasping the kidney to deliver it into the wound with gentlest of traction, an adhesion seemed to give way, followed by a profuse hemorrhage, which was controlled by pedicle clamps. The bleeding vessel could not be isolated sufficiently to apply a ligature. Advantage for the time being was taken of the hæmostasis effected by the clamps, and the kidney was split, according to Hyrtl-Zondek, from pole to pole. The bisection was naturally bloodless, and parenchyma, and *all of the kidney, to the fullest extent that it could be rendered visible in situ, showed absolutely no trace of disease.* Intending to save the kidney, it was sutured and several attempts were again made to isolate the injured vessel of the renal pedicle, which proved futile. Inasmuch as the clamps applied included so much, if not all of the vascular pedicle, nephrectomy became obligatory and ablation

FIG 1



Tubercular ulcer of pelvis of kidney. (The ulcer seen on the papilla jutting into calyx above should have been below, the ureter having been drawn in the wrong direction.)

of the kidney followed, with the clamps left *in situ*. The shocked condition of the patient and the loss of blood called for rapid work, hence no ligature was applied to the pedicle, which was short and greatly thickened by the cicatricial tissue surrounding it. The wound was tamponed with sterile gauze and the clamps removed on the fifth day. The subsequent healing of the wound was protracted over many months. This tardiness, as well as the flabby appearance of the granulations, in all probability due to an infection of the *terrain* of the operation by splitting of the kidney for inspection, emphasized anew the tuberculosis of the kidney removed.

DESCRIPTION OF THE SPECIMEN.

Macroscopic.—In the nascent state, when the kidney was still further divided so as to explore the interior of the pelvis, an irregular undermined necrotic ulceration 0.5 cm. in diameter was disclosed near the lower pole, on the tip of a papilla jutting into the lower calyx (Fig. 1). In good light, it was easily recognized that the color of the papilla was much paler and of a yellowish-white color, the markings not as discernible as in other papillæ, and the distinctions at the confines of cortex and medulla effaced.

Microscopic Examination.—Tubercle bacilli were recovered from the scrapings of the base of the ulcer. Sections about the papilla showed lymphoid reticulated stricture, with areas of poorly stained cells due to necrosis, characteristic of tuberculosis. Towards the base of the papilla the process was older, as evidenced by the increase of the interstitial fibrous tissue, which had replaced the destroyed tubules. In some of the ureter saved from the fragmentary condition of the pedicle necessitated by the exigencies of the case, distinct tubercles and giant cells were to be seen.

Epicrisis.—But for the accidental injury of the vessels, we should have improperly judged the kidney to be the seat of no tuberculous lesion, because there were no signs of such visible in the cortex or kidney parenchyma exposed to view. The subsequent findings as well as the consequent tedious behavior of the wound point to an infection of the field from the exposed diseased parenchyma.

The significant lesson to be learned from this single experience is that if ureter catheterization shows the presence of undoubted tubercle bacilli,[1] immediate nephrectomy is none the

[1] This dictum does not apply to cases of tubercle bacilli eliminated in urine without urinary symptoms or signs.

less indicated, without division of the kidney, to confirm the findings in the face of doubt arising because of the absence of superficial lesions.

In other words, the finding of tubercle bacilli by ureter catheterization is paramount to and renders superfluous subsequent exploratory nephrectomy. By such a procedure in very early cases, and all the more so in advanced tuberculosis with apparent lesions, the chances of infecting the wound and causing a tardy convalescence are reduced to a minimum.

Because of the stricture in the lower end of the ureter and the findings of tubercles in the upper ureter, and the location of the ulcer in the lower calyx, contiguous to the diseased ureter, the question might arise: Was not this an ascending tuberculosis? Against this it will suffice to point out that the entire pyramid belonging to the papilla was diseased and the changes near the base were of a fibrous character.

We can assert merely speculatively that with the tendency to stricture formation of the ureter its ultimate obliteration was likely, and this patient if not operated upon would have eventually developed a closed tuberculosis of the kidney, none the less calling for ultimate surgical intervention.

End Result.—Relief from the painful and frequent micturition followed the nephrectomy. The urine also cleared, and this amelioration remained for six months. At the expiration of this time a return of these symptoms set in, associated with a left-sided tuberculous epididymitis so acute in its development and so extensive that a castration was performed. The vas was as thick as a lead pencil and the cord structures much thickened. Though the immediate result was primary union, two months later a sinus formed which yielded admirably to treatment with the Bier cup.

In the meantime hæmaturia has appeared on several occasions, which the cystoscope showed to come from the very much engorged prostate and large vessels overlying. From the left ureter clear urine is seen to issue. Notwithstanding these complications, the patient's general health is good and he has gained 10–12 pounds.

THE SURGICAL TREATMENT OF NON-RESILIENT DIVERTICULA OF THE BLADDER.*

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THE comparative infrequency of large diverticula of the bladder has prompted me to report in detail a case which I have observed, and to review the methods employed in the surgical treatment of this affection.

While cystoscopists of experience are apparently agreed that diverticula of the bladder associated with urethral or prostatic obstruction or the presence of stone are relatively frequent, such sacculations, whether single or multiple, are usually unassociated with peridiverticular adhesions and tend to disappear after the removal of the cause of increased intravesical pressure. In this connection I wish to deal only with that form of diverticulum, usually of large capacity, which, owing to the existence of adhesions to the surrounding organs or to the paucity of the muscular element in the sac wall, is characterized by the absence of expulsive force. From the point of view of pathogenesis one should not include as true diverticula those cases which are a sequence of perivesical suppuration, although from the point of view of diagnosis and treatment they are indistinguishable from such as result from attenuation of the bladder wall through pressure.

VARIETIES.—Large diverticula may be either congenital or acquired. I am not aware of any case in which a diverticulum has been found post mortem in infancy; Pean's [1] case, however, strongly supports the congenital theory, as does a case reported by Hofmokl and Ghon,[2] especially as in the female the conditions chiefly considered as causative factors,

* Reported in the Surgical Section of the Canadian Medical Association, August, 1907.

such as urethral stricture and prostatic hypertrophy, do not exist. Nor was there found in these cases any evidence of spinal injury or disease.

SYMPTOMATOLOGY.—The variations in the symptom complex in vesical diverticula are so numerous that I have given somewhat in detail the symptomatology in each case of the series reviewed. A case reported by Murchison [3] illustrates in a striking way the occasional obscurity of the urinary relation and the difficulties of diagnosis where cystoscopy cannot be carried out. Generally speaking, however, the symptoms complained of are those of an acute cystitis, that is, pain, frequency of micturition, and the passage of cloudy, malodorous urine. Micturition may be associated with severe tenesmus. The frequency with which a tumor has been found, generally situated to one side of the median line, is noteworthy. Possibly, however, the most characteristic symptom is the ability of the patient to repeat the act of micturition after a short interval. In such cases the introduction of a catheter after voluntary urination usually evacuates a large residue. While the stoppage of the stream in the first act is no doubt due to the passage of the vesical contents in the direction of least resistance, that is, into the diverticular sac, a reversal of this process is initiated as soon as the expulsive efforts of the bladder cease, and continues until the pressure in the two cavities is equalized. Where the diverticulum occupies a dependent position there is always residual urine, and one generally fails in attempts to wash the bladder clean,—which adds greatly to the difficulties of the cystoscopist. The writer's case illustrates very well this latter point, as upon first examination, owing chiefly to the fact that the distending fluid was cloudy, the presence of a diverticulum was overlooked.

In the majority of cases there is a history of recurring febrile attacks associated with chills, with or without symptoms of renal involvement.

Where the diverticulum replaces an abscess cavity, there is of course a history of the sudden evacuation of a large amount of purulent urine. This symptom of urgency is also

associated with those cases in which a sudden evacuation of the diverticular contents follows periodical occlusion of the orifice.

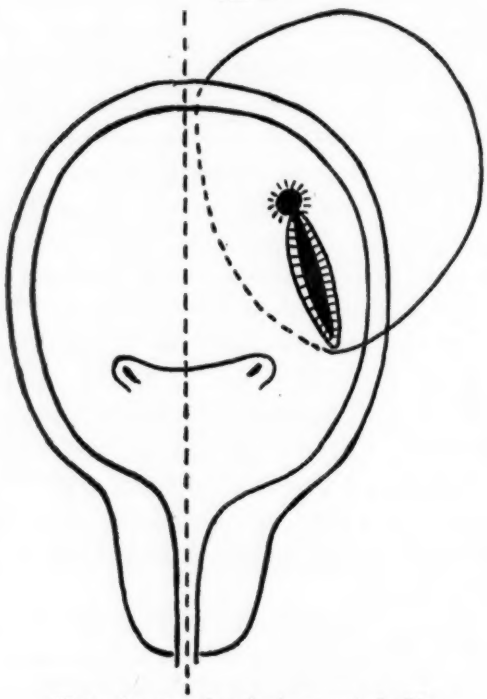
COMPLICATIONS.—The burden of the literature on this subject deals with post-mortem findings, the cardinal complications observed being severe vesical or diverticular inflammations, displacement and dilatation of the ureter, pyonephrosis, perivesical abscess, peritonitis, and femoral thrombosis. Pressure upon and deflection of the ureter above its intramural course is a frequent complication and leads eventually to dilatation of the ureter and of the renal pelvis. With the advent of infection there follows, in consequence of the ureteral obstruction, widespread renal suppuration and impairment or destruction of the renal function. In the author's case the renal symptoms were decidedly the most striking when the patient first came under observation, the presence of a diverticulum remaining unrecognized for some time. In Cases III, V, and VII of the series reviewed the diverticular orifice was found to occupy the normal site of one of the ureters, and the ureter of the corresponding side to discharge directly into the diverticulum. Careful perusal of the cases reported strongly substantiates Young's [4] opinion that this condition of affairs is due to a gradual inversion of the ureteral orifice through extension of the diverticulum and not to sacculation of the ureter itself.

TREATMENT.—*Catheterization.*—The use of the catheter for retention and irrigation is at best a makeshift, as, owing to the fact that the communication with the bladder seldom provides dependent drainage, irrigation cannot possibly give permanent relief or even free the urine from pus. There are no successful results recorded from this method of treatment.

Drainage.—Suprapubic cystostomy undoubtedly gives temporary relief and is properly undertaken in weak individuals. The absence of resiliency in the diverticulum, however, deprives this method of treatment of any permanent value. In a case reported by Burckhardt [5] a perineal drain was inserted, but the patient died.

Enlargement of the Orifice.—In considering this form of treatment the position of the diverticulum must be one's chief guide. Where the accessory sac is found to underlie the trigone of the bladder, or where the most dependent portion of the diverticulum is on a lower level than the base of the bladder, treatment by this method cannot be expected to yield

FIG. 1.



Illustrating operation of enlargement of orifice.

a cure. Where, however, the diverticulum is in the course of the urachus, or is so placed that the incision may be carried to its lowest level and still be above the base of the bladder, it is conceivable that the result might be satisfactory, provided there remained no obstruction in the course of the urethra, either from enlarged prostate, spasm of the sphincter, or urethral stricture. As the reflection of the diverticular wall upon the outer surface of the bladder may extend for only a

short distance around the opening of communication, the corresponding cut edges of the bladder and diverticulum should be carefully approximated by sutures in order to forestall the danger of an extravasation into the pelvic cellular tissue. A case reported by Young [4] in which this method of treatment was followed, resulted in the re-establishment of voluntary micturition but a residual urine of 300 c.c. necessitated the use of the catheter at bedtime (Fig. 1).

Suture of the orifice of the diverticulum without excision of the sac has been practised by Pousson,[6] who reports a case in which after the mucosa of the diverticulum had been thoroughly curetted and the margin of the orifice freshened, closure was effected by means of catgut sutures. The operation is said to have been successful; but the procedure, for very patent reasons, is not to be recommended.

Complete Excision of the Diverticulum.—This would appear to be the only method yielding permanently satisfactory results. Where obstruction is present it should be dealt with primarily, or at least at the same time that the excision of the diverticulum is carried out. Further, in cases where pyonephrosis exists as a complication, and examination of the segregated urine shows extensive impairment of the renal function, it would seem rational to deal in a radical way with the complication before attempting bladder suture in the presence of a constant inflow of purulent material.

The literature contains the reports of ten cases treated by complete excision, which owing to the varied symptomatology and different operative methods employed are, in addition to the author's case, given somewhat in detail.

Case I—(Author's Case, 1906).—R. F., aged 32, was first seen on October 27, 1906. His complaints were pain in the right loin, frequency of micturition, interruption of the stream, and attacks of fever. His family history was negative.

Personal History.—Since adolescence he had experienced difficulty in emptying the bladder, the act requiring as a rule several minutes. In 1897 he contracted a severe urethritis, which became chronic and was complicated at first by cystitis and later by what

was diagnosed as pyelitis. Subsequently there was marked impairment of health; the urine from time to time became extremely cloudy and fetid; and frequent attacks of cystitis, occasionally complicated by retention, necessitated the use of the catheter. Throughout this period a marked irritability of the sphincter urinæ led to frequent interruptions in the act of micturition. In 1902 the patient was sent to Arizona for one year, where he subsisted largely on a milk diet with beneficial results. After his return to work he was from time to time interrupted in his vocation by attacks of cystitis, necessitating bladder lavage and the use of urinary antiseptics. In August, 1906, a severe febrile attack intervened, associated with pain in the right side. In September a second and in October a third attack similar in every way occurred. It was during convalescence from the last attack that the patient came under my observation.

On examination there was found tenderness on deep pressure in the right flank. The bladder dulness extended above the symphysis half-way to the umbilicus. The urine was cloudy, specific gravity 1.018, acid, and contained albumin, casts, and a large quantity of pus. The residual urine amounted to 200 c.c. The act of micturition was prolonged by pressure upon the lower abdomen. The evening temperature was 103° F., falling to 99° in the morning.

Digital examination of the rectum showed the prostate to be normal; the seminal vesicles were slightly thickened and somewhat tender. Above the prostate, extending to the right, could be felt a large, boggy mass which was considered to be a dilated, atonic bladder.

A cystoscopic examination by Dr. R. P. Campbell on October 30 revealed the following facts:

The bladder held 350 c.c. with but a slight feeling of distention. The bladder wall was hypertrophied and trabeculæ were everywhere visible; some cystitis was present, most marked about the trigone, but not sufficient to account for the quantity of pus present. The urethral orifice appeared normal and the ureters were easily catheterized. The right ureteral terminal was displaced towards the median line. The urine from the right ureteral catheter flowed steadily drop by drop (evidently from a dilated ureter) filling two test-tubes, while the secretion from the left side, flowing at a normal rate, filled one-half a test tube.

The urine collected by catheter from the bladder and from the two kidneys when compared showed:

	Common	Right	Left
	Turbid	Turbid	Clear
	Acid	Acid	Acid
Specific gravity	1010	1009	1025
Albumin	Present	Present	Trace only
Urea		0.8 per cent.	2 per cent.
	Pus	Pus	No pus
	Bacteria	Bacteria	No bacteria
	Blood cells		
Cultures	*B. pyocyaneus*	*B. pyocyaneus*	An occasional
	B. coli		colony of
			B. coli

Diagnosis.—Spasm of the sphincter, hypertrophy and dilatation of the bladder, chronic cystitis, dilatation of the right ureter (above the ureteral sphincter), chronic suppurative pyelonephrosis.

Rest in bed and lavage of the bladder effected within a few days a marked improvement in the patient's general condition, the evening temperature falling to 99½°. An attempt was made by means of vaccines prepared from devitalized cultures to induce a bacterial immunity to both *B. pyocyaneus* and *B. coli communis* under strict opsonic observations. Before inoculation with composite vaccine the index to *B. pyocyaneus* was 1.25; and that to *B. coli,* 2. On November 18 the indices were 2.5 and 6 respectively. At this time the temperature showed an increase in the evening registration; and, fearing a recurrence of the former severe febrile symptoms with attendant toxæmia, I decided to remove the right kidney.

On November 22 a nephrectomy was performed under ether anæsthesia. As was expected the ureter, pelvis, and calices were found greatly dilated. Secreting tissue remained in isolated areas, chiefly at the two poles; and there could be seen macroscopically numerous small abscesses throughout the gland. Cultures from the pelvis of the kidney upon agar slants yielded within twenty-four hours pure growths of *B. pyocyaneus.* Following the operation there was an immediate cessation of the pyrexia. As, however, in spite of daily irrigation of the bladder the urine continued to be cloudy, on December 5 under a general anæsthetic a suprapubic drain was inserted. On exploration of

the interior of the bladder a small opening was observed to the outer side of the right ureteral orifice through which purulent material exuded. A probe thrust into this opening could be felt per rectum to pass to the posterior wall of the pelvis. The orifice of communication was found to admit readily large blunt forceps, through the open jaws of which a drainage tube 1 cm. in diameter was inserted. The anterior extremity of the tube was then sutured to the margin of the suprapubic wound.

Following this procedure the urine showed a very marked decrease in the amount of pus present. At the end of ten days the diverticulum tube was removed and at the end of three weeks the suprapubic opening was allowed to close. The temperature maintained an afebrile course. During the next two months the bladder was irrigated daily; and upon several occasions the suprapubic wound closed, only to open again in from four to six days. Throughout this period it was noticed that although micturition could be readily initiated, the stream rapidly declined after the passage of 240–280 c.c. A few minutes later the patient was able to pass a similar amount, this state of affairs being due evidently to the passage of the urine on contraction of the bladder into an accessory cavity offering less resistance than the *via naturalis*. It was further observed that if catheterization were employed, the instrument if re-introduced in ten or fifteen minutes evacuated a further amount of 180–250 c.c.

A cystoscopic examination was again undertaken and the existence of a large diverticulum demonstrated. The opening from this into the bladder was found about 2.5 cm. to the outer side of the right ureter. This cavity was further determined to be of large dimensions, probably capable of holding 200–250 c.c., as it was possible to introduce the cystoscope through the opening (1 cm. in diameter) into a cavity which appeared to be almost as large as the bladder itself.

Operation, February 28.—Extravesical, extraperitoneal excision of the diverticulum; re-establishment of suprapubic drainage.

Under ether anæsthesia a vertical incision was made through the lower segment of the right rectus muscle. The peritoneum was readily stripped back to the upper margin of the diverticulum; but owing to the close adhesion of the wall of the accessory cavity to the outer surface of the bladder for some distance from the opening of communication, it was found impossible to isolate

the neck of the sac without re-opening the suprapubic wound. With the tip of the left forefinger passed through the orifice of the diverticulum and used as a retractor and guide, the separation of the diverticulum from the bladder was readily effected. After the neck of the sac had been divided, the bladder was closed extravesically by means of a purse-string suture. This was reinforced and the bladder wall further inverted by a continuous catgut suture. The enucleation of the sac presented little or no difficulty. It was found to extend below for a considerable distance undermining the trigone, behind to the posterior wall of the rectum and laterally to the pelvic wall. Drainage of this cavity was provided by means of a rubber tube passed behind the prostate and through the perineum without communicating with the urethra. Complete closure of the lateral suprapubic incision and partial closure of the suprapubic wound after excision of scar tissue concluded the operation. Intravesical pressure was provided against by means of a small suprapubic siphon. Convalescence was rapid and uninterrupted. The perineal drain, which was apparently unnecessary, was removed on the third day; and at the end of three weeks, after I had determined by cystoscopic examination through the suprapubic wound that the diverticular opening was firmly united, the suprapubic siphon was removed.

A microscopic examination of the excised diverticulum showed the wall to consist of several layers of flattened cubical epithelium; a well-defined submucosa; muscle bundles running in various directions; and externally a layer of loose connective tissue.

Owing to the recurrence from time to time of a suprapubic fistula, the patient was given an anæsthetic on May 18, and the sphincter urinæ dilated to 42 F. with a Kollmann instrument. The suprapubic wound closed finally within ten days.

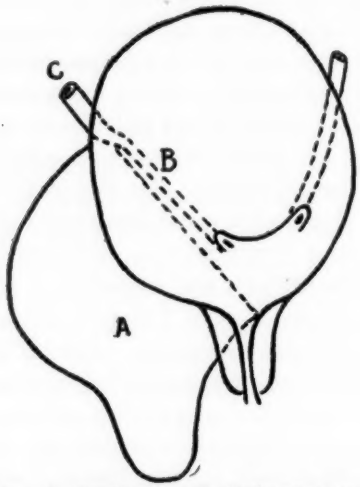
On June 15 the patient was discharged well. The urine at this time was clear and contained but few pus cells and bacteria. The residual urine varied between one and two ounces.

Subsequent History.—Apart from a mild attack of prostatitis in May, 1908, at which time there was a residual urine varying between one-half and two ounces, the patient has been free from urinary symptoms.

Remarks.—In reconsidering this case in detail, I am of the opinion that the diverticulum was most likely congenital in origin, although I am aware that this is not capable of

proof; the early symptoms, however, support this view. With such a condition existing an infection alone was necessary to produce the subsequent train of symptoms; this in time arrived. It is further probable that infection of the kidney was favored by the pressure of the diverticulum upon the ureter at some little distance from its vesical orifice. This theory would also account for the extreme dilatation of the ureter without involvement of its vesical terminal.

FIG. 2.



Illustrating author's case. *A*, diverticulum; *B*, displaced ureter and ureteral orifice; *C* dilated ureter above intramural course.

If the diverticulum were of recent development, the spasm and hypertrophy of the sphincter must be considered the etiological factor, as they furnished sufficient obstruction to produce sacculation. As an illustration of the degree of obstruction produced by the sphincter, one has only to recall the repeated failures to close the suprapubic wound (Fig. 2).

ABSTRACT OF CASES.

CASE II (PEAN,[1] 1895).—Congenital vesical diverticulum and supernumerary urethra in a girl aged fifteen. There had been incontinence from birth. On examination there was found on the anterior wall of the vagina a median protrusion the size of a nut. On digital pressure over the tumor urine was seen to escape from a narrow opening placed in the median line 3 mm. below the external orifice of the urethra. On the

supernumerary external orifice being obstructed with the finger and pressure again exerted, there was a gradual diminution in the size of the tumor and the patient complained of a desire to urinate. Under a general anæsthetic an incision was made over a director along the anterior wall of the vagina, the diverticular tract excised, and the opening into the bladder sutured. The patient was cured.

CASE III (CZERNY,[1] 1896).—A young man, aged 31 years, developed after traumatism a stricture of the membranous portion of the urethra, followed by retention, cystitis, and pain in the region of the left kidney. On examination there was found to the left of the median line a tumor the size of a child's fist which on compression discharged its contents into the bladder. Suprapubic cystostomy disclosed a greatly thickened bladder with a finger-shaped prolongation towards the navel. In the region of the left ureteral orifice a large diverticulum was demonstrated, the opening of communication admitting the finger. The accessory sac completely filled the small pelvis, and contained foul urine and epithelial detritus. Suprapubic drainage was continued for a fortnight without freeing the urine from pus, and excision of the diverticulum was decided upon. The left rectus was incised transversely. Many adhesions were encountered, especially in the region of the rectum and in the hollow of the sacrum. During the operation the peritoneum and the left ejaculatory duct were injured. The left ureter was dilated and passed obliquely through the wall of the diverticulum. It was divided and implanted into the bladder wall. The wall of the excised diverticulum contained muscular and epithelial elements. Convalescence was retarded by the formation of a ureteral-abdominal fistula. Four months later the left kidney, the seat of pyonephrosis, was extirpated. At the time that the patient was discharged, the bladder held 150 c.c. and he was able to retain his urine from two to three hours.

CASE IV (RIEDEL,[2] 1903).—The patient, aged 61 years, was admitted to the Surgical Clinic in Jena on December 20, 1902. He had experienced difficulty in urinating for three years. Latterly the use of a catheter had been necessary. On examination there was found marked enlargement of the prostate. Prostatectomy was performed. Five months later, in May, 1903, symptoms of obstruction returned, with pain in the right side above Poupart's ligament, for the relief of which a perineal section was performed. On June 13, 1903, suprapubic cystostomy revealed the presence of a large diverticulum communicating with the bladder through an opening 2 cm. in diameter. The bladder was closed and a second incision made through the right rectus muscle. The accessory sac was excised and the communication with the bladder closed with catgut suture. Perineal drainage was re-established. Collapse and death occurred on the following day.

CASE V (PAGENSTECHER,[3] 1904).—The patient, a male aged 33 years, was seen in August, 1903. During the preceding winter he had suffered for two or three days from pain in the bladder and on micturition. Five weeks later the pain had returned with strangury and tenesmus every half hour. On admission the distended bladder could be felt above the

pelvic brim. After evacuation with a rubber catheter, a solid instrument when introduced withdrew a further amount of turbid, bloody urine, and the abdominal tumor disappeared. On subsequent irrigation the bladder was found to hold as much as one litre. Cystoscopy was unsuccessful; and on August 30, 1903, suprapubic exploration was undertaken. In the position of the left ureter was found the opening of a large diverticulum.

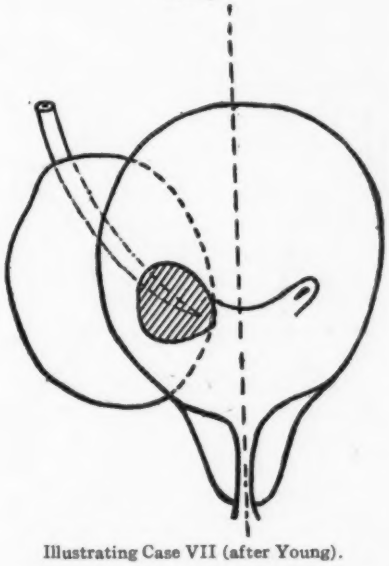
As there was no improvement in the patient's condition following drainage, extirpation of the diverticulum by the sacral route was carried out on December 16. The left ureter, which opened into the accessory cavity, was implanted into the bladder at the former opening of communication. A self-retaining catheter was placed in the urethra. The excised sac contained in its walls bundles of smooth muscle fibres running in various directions and a well-marked submucosa. Of the epithelial lining only a few fragments were preserved, In addition to a sacral fistula the suprapubic wound continued to discharge for some time. In February both fistulæ had healed, but in March the sacral fistula reopened, urine escaping during micturition.

Case VI (von Eiselsberg,[10] 1904, reviewed by Christie).—In the discussion upon Pagenstecher's paper, von Eiselsberg reported a case of vesical diverticulum which had come under his observation, in which a palpable suprapubic tumor disappearing under pressure was followed by a desire to micturate. The presence of a diverticulum was confirmed by cystoscopic examination, the orifice of communication with the bladder being situated at the base. Excision of the sac was successfully practised. Details as to operative procedure and histological examination of the sac wall are not given.

Case VII (Young,[4] 1904).—The patient, a male aged 30 years, was seen in January, 1904, complaining of frequency of micturition and pain in the back. There was a history of severe attacks of urethritis in 1893 and 1898. During the last attack a tight stricture in the bulbomembranous region was found to exist, for the relief of which a combined external and internal urethrotomy was performed. During the next three years the patient was free from urinary symptoms. About April, 1902, he had an attack lasting one week, characterized by obstruction and frequency of micturition. Three months later a second attack similar in every way occurred. In September, 1903, a third attack supervened, and in October a fourth attack with pain in the right side of the pelvis and severe tenesmus culminated in the sudden passage of a quantity of pus. It was thought that an abscess had ruptured into the bladder. Although retention occurred, a catheter could be passed without meeting with obstruction. Bladder lavage was practised without diminution in the amount of residual urine. On December 9 pain and tenderness developed in the right flank beneath the costal margin. On January 4, after coming under observation, the patient had a similar attack lasting several hours, which necessitated the use of morphine. At this time fever, nausea, and the presence of muscular rigidity over the right kidney were observed. Examination showed the prostate to be slightly harder than normal, but there was no evidence of stricture. There was a residual urine of 350 c.c. The bladder

was washed clean with difficulty. Pressure on the lower abdomen was necessary to evacuate completely the bladder contents. The cystoscope revealed a large diverticulum with an orifice of communication 2 to 3 cm. in diameter, situated in the position of the right ureteral opening. The left ureteral orifice was found displaced towards the left, with the opening of a second and smaller diverticulum lying above and to its outer side. The right ureteral orifice, of course, could not be seen, but it was subsequently found to open upon the inner wall of the larger diverticulum. For six weeks catheterization and lavage were practised, but without diminution in the size of the diverticulum or in the quantity of residual urine.

FIG. 3.



Illustrating Case VII (after Young).

Operation, February 10. Suprapubic extravesical excision of the large diverticulum with closure of the orifice was carried out; also drainage of the bladder through a perineal urethrotomy and drainage of the retrovesical space by means of a tube passed behind the prostate and through a posterior perineal incision without entering the urethra. The intradiverticular emplacement of the right ureteral orifice was brought forward by means of a flap operation (Fig. 3).

Owing to the failure of the suprapubic wound to heal, the presence of 30 c.c. of residual urine, and the recurrence of a small pouch at the site of the excised diverticulum on the right side—all indicating obstruction—a Bottini operation was performed on August 4.

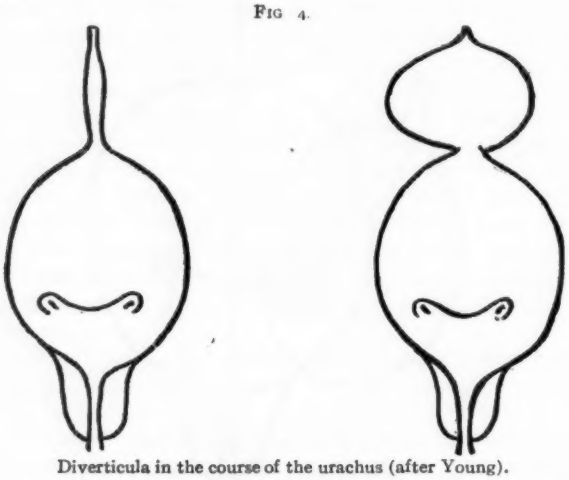
Examination of the wall of the excised diverticulum showed the presence of an epithelial lining and numerous layers of smooth muscle-bundles running in various directions. There was also present the usual evidence of chronic inflammation.

Five months after operation the patient reported his urine to be clear and the function of urination normal.

CASE VIII (YOUNG,[4] 1904).—Male, aged 34 years, was admitted to the Johns Hopkins Hospital on January 18, 1904. In March, 1899, the patient jumped from a moving locomotive, striking upon the buttocks. Following the accident he felt severe pain in the lower portion of the abdomen, and on examination found a lump about the size of a hen's egg below and to the left of the umbilicus. This swelling gradually subsided. There was, however, a return of the pain at the site of the tumor if the bladder were allowed to become distended.

On cystoscopic examination there was found in the region of the vertex the small orifice of a diverticulum. The bladder wall was not trabeculated.

FIG 4.



Diverticula in the course of the urachus (after Young).

Operation, January 28. Excision of a small diverticulum lying within a dilated urachus. On February 23 the patient was discharged well (Fig. 4).

CASE IX (YOUNG,[4] 1903).—Male, aged 63 years, was seen in February, 1903. In 1901 the patient first noticed frequency of urination and difficulty in starting the stream. At the time of admission urine was voided about every fifteen minutes. The patient had never had complete retention and a catheter had never been used.

On examination the urine was found to be normal. The prostate was moderately enlarged. On passing a catheter 1200 c.c. of residual urine was withdrawn. Cystoscopic examination showed intravesical prostatic hypertrophy, moderate trabeculation of the bladder wall, and on the right side anteriorly the opening of a diverticulum.

Operation, February 22. Suprapubic extravesical extraperitoneal excision of the diverticulum with suture of the orifice of communication; perineal prostatectomy. Enucleation of the diverticulum was effected without difficulty owing to the absence of dense adhesions. The capacity

of the diverticulum was estimated at 500 c.c. The bladder itself was not opened. The patient was discharged well on the twenty-seventh day following operation.

Microscopically the mural elements consisted of well-defined mucous, submucous, and muscular layers. There was no evidence of inflammation.

CASE X (PORTER,[11] 1907).—This patient, a male aged 34 years, first came under observation in April, 1906, complaining of difficulty in starting the stream, of frequency of micturition, and of the passage of foul urine which occasionally contained clotted blood. On examination the bladder was found to extend to the umbilicus. The residual urine varied from 19 to 24 ounces. Treatment at this time was declined. When the patient returned one year later, digital examination of the rectum showed the prostate to be moderately enlarged and cystoscopy revealed the presence of three diverticula, one of which was especially large, with its orifice of communication situated at the right side of the base of the bladder.

On April 30 suprapubic drainage was established. On May 21 the bladder was reopened suprapubically, and the sphincters of the diverticula widely dilated. The patient was discharged in August, but leakage still occurred from the suprapubic wound.

He returned in September suffering from epididymitis and pain in the region of the left kidney.

Operation, September 8. An incision was made parallel with Poupart's ligament. The peritoneum was opened and an elastic swelling the size of a banana, extending backward and to the left of the base of the bladder, was found. In order to separate the accessory sac from the rectum the bladder was again opened and the forefinger inserted into the diverticulum as a guide and retractor. The orifice was closed with two layers of catgut sutures. Suprapubic drainage was provided and a rubber catheter placed in the urethra. At the end of October the patient was reported to be much improved in health, but in the absence of urethral drainage leakage still occurred at the site of the bladder suture.

CASE XI (WULFF,[12] 1904).—The patient, a male aged 34 years, first experienced difficulty in micturition in May, 1903. In July, while confined to bed, he suddenly lost the power of voluntary urination. A large quantity of urine was withdrawn by catheter. Although voluntary micturition was subsequently restored, there remained a residue of one litre which, however, did not produce discomfort. The condition was at first thought to be due to a disturbance of the sensory nerve supply. On examination some months later there was found in the right lower quadrant a large tumor, which catheterization failed to reduce but which on pressure suddenly discharged into the bladder a large quantity of fetid, brownish-yellow fluid. Cystoscopy showed the presence of a diverticular opening on the right side.

Operation.—An incision was made parallel with Poupart's ligament, the peritoneum stripped back, and the diverticular sac opened and evacuated. The cavity was then tamponed.

Three weeks later the sac was resected and the orifice of communication with the bladder sutured. Intravesical tension was provided against by means of a permanent urethral catheter.

Several weeks later, owing to the failure of the bladder suture line, the opening into the bladder was again exposed and the edges freshened and resutured. At the end of a further period of several weeks the patient was discharged. The wound had healed. The urine, voided spontaneously every three hours, was for the most part clear. There was a residue of 150–200 c.c. On cystoscopic examination the mucous membrane at the site of the suture was found to be firmly united. Whether the presence of the residual urine was due to atony of the vesical wall following the prolonged distention, or whether due to defective enervation, had not been determined. The wall of the excised sac contained epithelial and muscular elements.

ETIOLOGY.—Of the series of eleven cases reviewed, I, II, V, VIII, X, and XI belong to the congenital variety, although positive evidence of congenital origin can be said to exist only in Case II, reported by Pean.[1] In this connection it is fallacious to lay too much stress upon the presence of bladder epithelium and muscular tissue in the wall of the accessory sac, as these elements may be present in cases where prostatic hypertrophy has been considered the etiological factor (IX) and also in cases in which a urethral stricture has existed (III and VII).

To prostatic enlargement may be ascribed the development of the diverticulum in Cases IV and IX. Porter's [11] case may belong to this category. The note on the prostatic condition is not very definite. While the age would suggest a congenital origin, it does not exclude a prostatic causation.

Urethral stricture was present in Cases III and VII. Owing to the persistence of obstructive symptoms (that is, pouching of the suture line and residual urine) after extirpation of the diverticulum, a Bottini operation was performed in Case VII with permanently satisfactory results.

The etiological factor in the case reported by the writer must remain in some doubt; the history on the one hand suggests the possibility of the diverticulum having been congenital, while on the other the presence of hypertrophy and spasm of the sphincter urinæ cannot be left out of consideration.

Traumatism was undoubtedly the exciting cause in Case VIII. The urachus had probably remained patent from birth.

Perivesical suppuration has to be considered as possibly the precursor of the diverticulum in Case VII, in view of the history of a sudden evacuation of a large quantity of pus. Opposed to this theory are the facts that a stricture had existed in the bulbomembranous portion of the urethra and that the diverticulum was lined with epithelium and contained muscular elements in its wall.

While no case of diverticular formation secondary to congenital stricture of the meatus urinarius has been reported, the possibility of this condition figuring as an etiological factor should be borne in mind.

Phimosis was associated with the formation of a vesical diverticulum in a child 21 months old, observed by Lennander [13] and cited by Young.[4]

Spinal injury or disease as an etiological factor was first suggested by Hale White.[14]

Von Eiselsberg's [10] case (VI), owing to the absence of details, cannot be classified.

Age.—It will be seen from the foregoing that. apart from Cases IV and IX (prostatics, aged 61 and 63 years respectively) and the case reported by Pean,[1] all those included in our series occurred in individuals between the ages of thirty and thirty-four. This fact is most striking and suggests the possibility that they were all congenital in origin; that is to say, even the two cases with a history of pre-existing stricture present features which bring a congenital hypothesis within the limit of reason.

Prognosis.—Out of the eleven cases reviewed. the operation of excision of the diverticulum was followed by the restoration of the normal function of urination in eight instances. In two cases urinary fistulæ persisted at the time of their being reported, and in one case the operation was followed by collapse and death. The age at which the majority of these cases occur imposes a grave responsibility upon the surgeon. With modern methods of investigation, physical, biological, and chemical, applicable to the urinary tract, a correct diagnosis should practically always be made early in

the affection, and with a method of procedure well established these cases should be accorded a favorable prognosis.

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FIBROLYMPHOSARCOMATA OF BOTH URETERS METASTATIC TO A PRIMARY LYMPHOSARCOMA OF THE ANTERIOR MEDIASTINUM OF THYMUS ORIGIN.*

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MALIGNANT neoplasms of the ureters, whether primary or secondary, are of rare occurrence. Sarcomas are particularly so, there having been collected by Albarran in all only eleven cases, four of which, upon critical examination, may be excluded. Of the remaining seven cases the sarcomas of the ureter in each case were connected either with the pelvis of the kidney or the bladder. In the present case there is no involvement whatever of any other portion of the genito-urinary tract nor of the immediately adjoining tissues of the peritoneum, the neoplasms being confined strictly to the ureteral tissues. In this latter respect, after a painstaking research of the literature, it appears to be the first recorded case of its kind.

In brief, the following is the history of the case:

V. R., female, single, 27 years of age, a nurse, was admitted to the Metropolitan Hospital on August 15, 1908. Until three years ago she had been always in excellent health. Had no hereditary diseases. Venereal history denied. Excellent habits. Her present illness began by sharp pains in the upper half of the sternum and back of the neck, radiating down both arms. In November, 1905, she first noticed an enlargement of the glands over the left clavicular sternal joint. The glands were at first soft, later becoming very hard, and painful upon pressure. Shortly all the superficial glands over the body became similarly involved. Extreme emaciation, dyspnœa, dysphagia

* Read before the Genito-Urinary Section of the New York Academy of Medicine, February, 1909.

and unbearable pains all over the body forced her to seek the hospital. Her skin had an ashy, cachectic appearance common to malignant disease. During her stay at the hospital her temperature ranged from 97° F. to 101.3° F., usually registering about 99° F. The pulse rate was continuously high—highest 140, lowest 80, average 116. Respiration: highest 36, lowest 18, average 26.

Urinalysis was negative. Blood analysis showed constantly a polymorphonuclear leucocytosis. At no time during her entire illness was there any symptom complained of that pointed to the genito-urinary sphere. From September 13 the patient sank rapidly. On the day of her death, November 18, 1908, she had two general convulsions, each lasting about two minutes.

Autopsy.—The body presented the usual signs of death; all the superficial lymphatic glands were enlarged, firm, confluent and non-adherent to the skin. Beneath the acromial end of the left clavicle, to the right of the axilla, was a hard lobular tumor mass lying beneath the pectoralis minor about the size of an average orange. This tumor was not connected with either the ribs or pleura. Over the sternal end of the left clavicle was a similar tumor mass.

The abdominal cavity contained about 500 c.c. of clear, pale amber transudate, free from any inflammatory products. The omentum was studded with small grayish white hard nodular masses averaging from 1 to 2 cm. in diameter. The mesentery and mesenteric glands were involved in new growths ranging from a millet seed to 5 and 6 cm. in diameter. The peritoneum was studded with similar tumor masses of various sizes. The stomach, and the intestines, both large and small, were normal. The retroperitoneal glands along the abdominal aorta were extensively involved in metastatic new growths. At the lower pole of the spleen was a metastasis 3.5 x 3.5 x 2.5 cm., sharply outlined from the surrounding territory. In the center of the spleen were similar metastases. *The liver presented no metastases;* it was amyloid. The pancreas was embedded in a mass of enlarged glands which had in some places invaded the pancreas structure. There were no metastases in the pancreas. Uterus and vagina normal. At the fimbriated end of the right tube there was a small metastatic tumor about 4 mm. in circumference. Along the left tube, about 2 cm. from the left horn of the uterus,

was a similar tumor about 3 mm. in diameter. Both pleural cavities contained about 800 c.c. of a pale amber-colored transudate. The pericardial sac contained 120 c.c. of same. The heart was normal except for presence of small degree of fatty degeneration.

Primary Tumor.—The superior third of the anterior mediastinum was entirely filled with a firm resistant tumor mass compressing the base of the heart and the œsophagus. This tumor had involved in its growth the anterior border of the upper lobe of the left lung and the upper half of the pericardium. The tumor mass appeared as though of one growth and not the union of several smaller growths. Section of this tumor mass showed extensive involvement of lung and posteriorly of the bifurcation of the trachea and larger bronchi. The tumor was exquisitely alveolar in structure and very firm in consistency. It was grayish white in color with numerous yellowish areas of fatty degeneration. Several areas had become necrotic. Nowhere could any remains of the thymus gland be found. The deep cervical glands were extensively involved on both sides of the neck.

Cross section of the (secondary metastatic) glandular tumor masses (as the cervical, axillary, posterior mediastinal), showed them to be characteristic of the anterior mediastinal tumor. Over the costal pleura of upper lobe of the left lung, and along the lower margin of the lower lobe were numerous small metastatic growths. At the base of the upper lobe of right lung was a small metastatic tumor. Likewise in the center of this lobe were two metastatic tumors about 1 cm. in diameter. Along the inferior margin of the middle lobe was a fringe of small tumors. The bronchi and bronchioles contained a yellow mucopurulent secretion, and were intensely congested. The upper half of the pericardium anteriorly was firmly adherent to the main tumor of the anterior mediastinum. The epicardium was not involved. Both tonsils and the thyroid were normal. The œsophagus was normal throughout. At its middle third it was greatly compressed by the enlarged mediastinal glands. The larynx and trachea were normal.

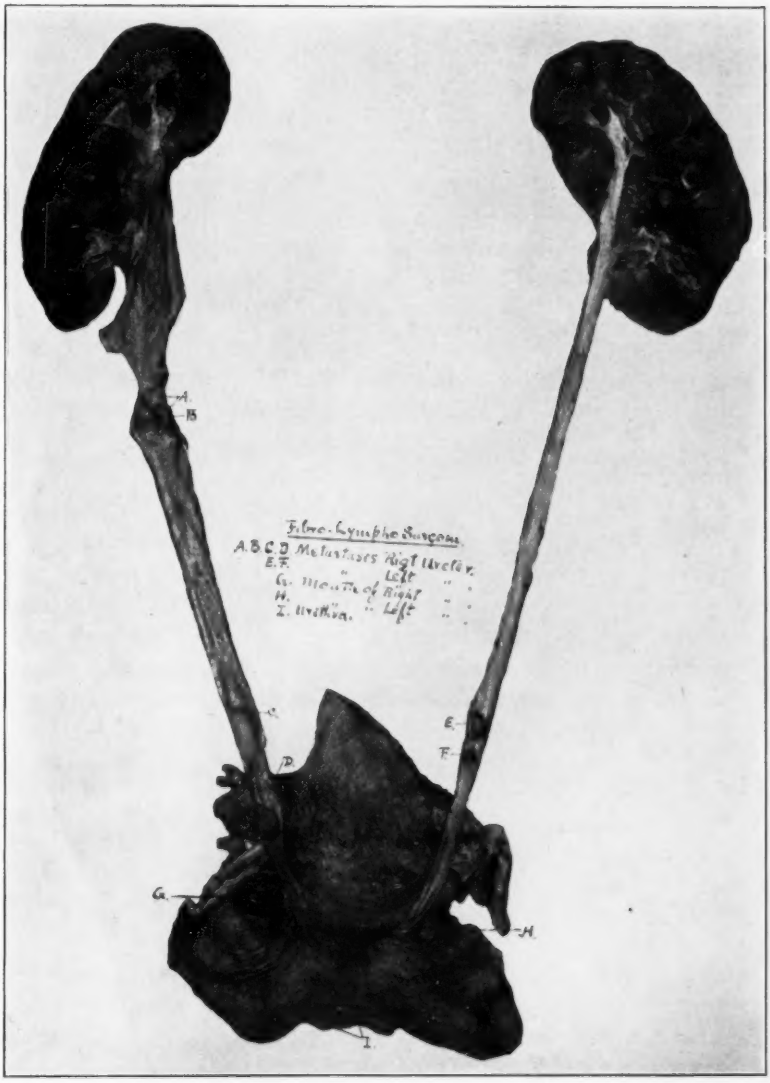
Genito-Urinary Tract.—The bladder and urethra were normal. The exits of both ureters into the bladder were normal and measured 5 mm. in circumference. Located 3 cm. from the

bladder end of the right ureter was a sharply defined, circumscribed, grayish white, firmly resistant tumor oblong in shape 1 cm. x 7 mm. x 5 mm. (*D*, Fig. 1). This tumor was strictly confined to the coats of the ureter, the peritoneal surface not being involved. The mucous membrane of the ureter directly over the tumor was destroyed, being substituted by the tumor structures itself. The mucous membranes on either side of the tumor was normal. The circumference of the ureter immediately below this tumor measured about 7.5 mm. Eighteen mm. above this tumor was a second tumor (*C*, Fig. 1) 2 cm. x 1 cm. x 5 mm., in every respect corresponding to the first one. The circumference of the ureter immediately below this tumor was 8 mm. The circumference immediately above was 17.5 mm. Ten centimeters above this second tumor was a third one (*B*, Fig. 1) 1.5 cm. x 1 cm. x 4 mm., and immediately above this one in immediate proximity, was a fourth tumor measuring about 7 mm. in diameter (*A*, Fig. 1). These latter two tumors in structure and appearance corresponded with the two lower down. The two upper tumors formed considerable of a stricture, the circumference of the ureter immediately below the upper pair of tumors being 2 cm., and immediately above 2.5 cm. The circumference of the ureter at the pelvis of kidney measured 3 cm. The pelvis of kidney was considerably dilated. Its mucous membrane was smooth, glistening and transparent. The mucous membrane of the entire ureter was apparently normal.

The right kidney was very firm in consistency, of a grayish brown color, and measuring 11.5 x 4.5 x 3.5 cm. The capsule stripped readily and surface of kidney was generally smooth. Upon cut surface the cortex measured about 5 mm. in diameter. Markings somewhat effaced. By transmitted light the cortex had a more or less semi-opaque ground-glass appearance. The pyramids showed a like appearance. Located in the capsule were numerous sharply defined grayish white homogeneous tumor masses that in no way involved the kidney structure. At the hilus of the kidney was one such about 1.5 cm. in diameter, but like those on surface of capsule did not extend on to and involve the kidney structure itself.

Located 7 cm. above the bladder end of the left ureter was a tumor 5 x 3 mm., likewise lying strictly within the coats of the ureter and not involving the peritoneal covering, in all respects

FIG. 1.



Metastatic sarcomata of both ureters. Reduced one-half natural size.

similar to those of the right ureter (*F*, Fig. 1). Five mm. above this tumor was a second one 1 cm. x 5 mm. of same characteristics as first (*E*, Fig. 1). The circumference of the ureter immediately below the first tumor was 7 mm. The circumference between the two tumors was 1 cm. The circumference immediately above the second tumor was 1 cm., and likewise the same to the pelvis of the kidney which was not dilated and in every respect presented a normal appearance. The left kidney presented about the same characteristics as described for the right kidney. There was no evidence of hydronephrosis. The mucous membrane of the entire left ureter appeared smooth, glistening and transparent.

Diagnosis.—Primary fibrolymphosarcoma of anterior mediastinum, involving left lung and pericardium. Metastatic sarcomas of the cervical, supraclavicular and infraclavicular mesenteric, retroperitoneal and inguinal glands. Metastatic embolic sarcoma of lungs, spleen, fallopian tubes and *ureters*. Amyloid degeneration of liver and kidneys. Chronic bronchitis.

Microscopical Examination.—Microscopical examination of the primary tumor showed evidence of Hassal bodies, thus stamping the origin from the thymus gland. It also showed excess of fibrous connective tissue and mixed sarcomatous cells, large and small round and numerous giant cells, the small lymphoid cells predominating. Eosinophile cells were not present. The same characteristics were present in the metastatic tumors except the absence of Hassal bodies.

There are two striking occurrences in the pathology of this case—one positive and one negative. First, why were there metastatic tumors in the ureters only, and none in the kidneys? and, secondly, why were there no metastatic tumors in the liver when the mesentery and retroperitoneal glands are so extensively involved? The question of the metastases of malignant tumors is an extremely interesting one, and it seems by comparison with other similar pathological studies—as the metastatic abscesses in the cases of pyemia and the secondary growths in the cases of the infective granulomata—that one must accept the truth of the theory of the *predilection of tissues*. Else how are we to explain the frequent occurrence of

metastatic tumors confined to the osseous system following primary malignant tumors of the prostate, or the predilection of the cerebral tissues for metastases of primary fibro-adenomata of the mammary gland? In the case herewith presented it is scarcely probable that no aberrant malignant cells had been brought to the kidneys or liver in a blood stream so enriched thereby. For examination of the capillaries of many of the internal organs shows abundance of metastatic sarcomatous cells.

There seems to be no other explanation of the negative findings in the liver and kidneys in this case other than that these tissues were capable of destroying the malignant cells that undoubtedly had been brought to them. How far the presence of amyloid degeneration in these two organs may have influenced the capability of the aberrant sarcomatous cells to grow therein must at present remain a speculative question.

The author acknowledges his thanks to Mr. Charles Brush for the excellent photograph illustrating this report.

CONGENITAL UNILATERAL ABSENCE OF THE UROGENITAL SYSTEM.

BY DONALD GUTHRIE, M.D.,
Clinical Assistant in St. Mary's Hospital.

AND

BY LOUIS B. WILSON, M.D.,
Pathologist and Director of Laboratories in St. Mary's Hospital, Rochester, Minnesota.

CLINICAL REPORT BY DR. GUTHRIE.—The following case is reported because of its anatomical and surgical interest. There are many cases reported in the literature of congenital anomalies of the female urogenital system involving one or more of its parts, such as imperforate hymen, atresia of the cervix or vagina, unicornate and bicornate uteri, double vaginæ, and, more rarely, the absence of the tube and ovary or kidney and ureter on one side occurring separately or together. Few of these cases have required surgery, except the cases of imperforate hymen, and the atresia of the vagina and cervix, which have been relieved by plastic operations upon the vaginal outlet or the cervix. One anomaly which has been observed, of a somewhat similar nature to the case reported, is a bicornate uterus, one side only of which communicated with the cervix and vagina, with the normal menstruation from that side, while the non-communicating side gradually filled with blood, forming a painful suprapubic tumor of the corresponding side. Five examples of this congenital condition have been operated upon at St. Mary's Hospital. In the majority of the cases reported, the conditions have been found during routine examinations, at operation, or at postmortem, and have been recorded because of their anatomical interest. From the conditions found in this case, we believe that the life of the patient would have been in serious jeopardy had not surgery intervened.

CASE 28914.—Mrs. P., aged 30. *Family history* negative.

Personal History.—Married two years; has never menstruated, but has had, since 14 years of age, peculiar symptoms at four-week intervals which she has regarded as her periods. These symptoms have been cramping, bearing down pains through the lower abdomen, backache, and headache. There has never been any vicarious bleeding.

Previous Diseases.—Tuberculous arthritis of the right hip when 8 years of age, leaving two inches of shortening and accounting for the deformity the patient presents (Fig. 1).

Present Illness.—Four months ago, at a period when she thought she should have been menstruating, the patient had an attack of severe cramping pain through the lower abdomen, which confined her to bed for one week. At the next period, four weeks later, the cramps returned and were much more severe, followed by tenderness over the whole right half of the abdomen. She was in bed two weeks, and it was at this time the tumor was discovered and operation advised and accepted. A letter from the attending surgeon states that on exploration he found a tumor, which he believed to be the uterus, devoid of attachments on the left side. The right side of the tumor was densely adherent, with attachments as high as the liver. The operation at this time was abandoned for fear of causing the immediate death of the patient. He suggests that the tumor was a deformed uterus filled with retained menstrual blood. The recovery from the operation was good and there were no symptoms until three weeks ago, when the cramping pain returned and has continued, the patient being confined to her bed most of the time since.

Examination.—Poorly-nourished female, short stature. Scoliosis, due to shortening of the right leg. Heart and lungs negative. Tumor palpable in right half of abdomen, extending from symphysis pubis to right costal arch, which is very near the crest of the ilium because of the scoliosis (Fig. 1). Tumor is fixed and tender.

Pelvis: Rudimentary labia majora, labia minora absent. Complete absence of the vagina, urethra easily admits the examining fingers, and a tumor can be felt high up in the pelvis, lying to the right.

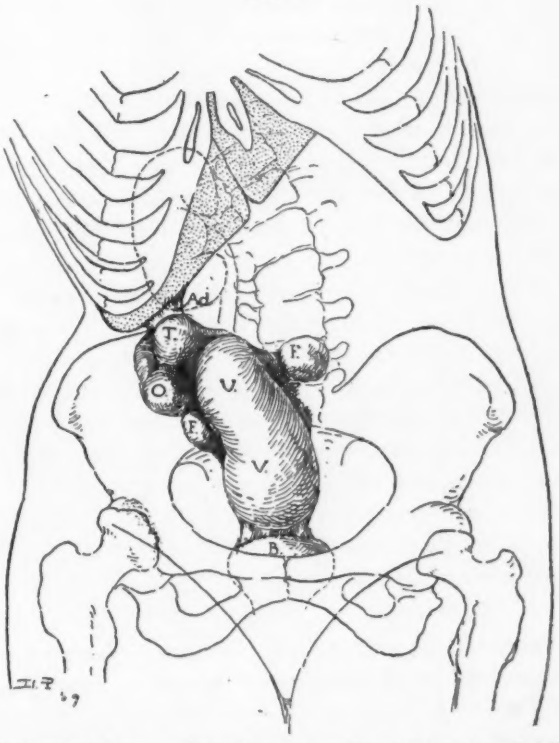
Blood: Hæmoglobin 70 per cent.; reds 3,800,000, whites 9,500.

Urine: 1016; alkaline; albumin, trace. Microscopic: erythrocytes.

Cystoscopic examination by Dr. W. F. Braasch: Urethra dilated, bladder normal size, left meatus absent. Dr. Braasch suggests the possibility of but one kidney (right).

Diagnosis.—Abdominal tumor—uterus? Congenital atresia of vagina (absence of left kidney and ureter?).

FIG. 1



Showing location of tumor. *U*, uterine portion; *V*, vaginal portion; *T*, fallopian tube; *O*, ovary; *FF*, fibroids; *Ad*, adhesions to liver; *B*, bladder with adhesions to closed end of vagina. The enlarged right kidney with absence of left kidney and ureter is indicated Incidentally also the right hip-joint disease and lateral scoliosis are shown.

Operation, January 28, 1909 (W. J. Mayo).—Tumor (Fig. 1), found to be the uterus, 18 cm. long and 9 cm. at its lowest widest portion, adherent below to the bladder and above to the under surface of the liver by adhesions to the right tube, which was distended. The ovary was cystic. There was an absence of the tube, ovary and broad ligament on the left side and of the

left kidney and ureter. The tumor was very adherent and removed with difficulty. Recovery was uneventful and a recent letter from the patient says she is enjoying good health.

It was not until the specimen was opened in the laboratory that the true condition of affairs was learned, it being supposed at operation that the whole tumor was uterus and that there was a complete absence of vagina.

Microscopical sections taken from the lower portion of the tumor (Fig. 2) proved the pathologist's belief—that the lower portion of the tumor was the upper portion of the vagina and not cervix—to be correct.

That there should have been a space of 10 cm. between the closed end of the vagina and the perineum is an interesting feature in the case, showing that, originally, only a small part of the vagina was formed and, as the organ grew and filled with blood it followed the line of least resistance and was forced upward into the abdomen.

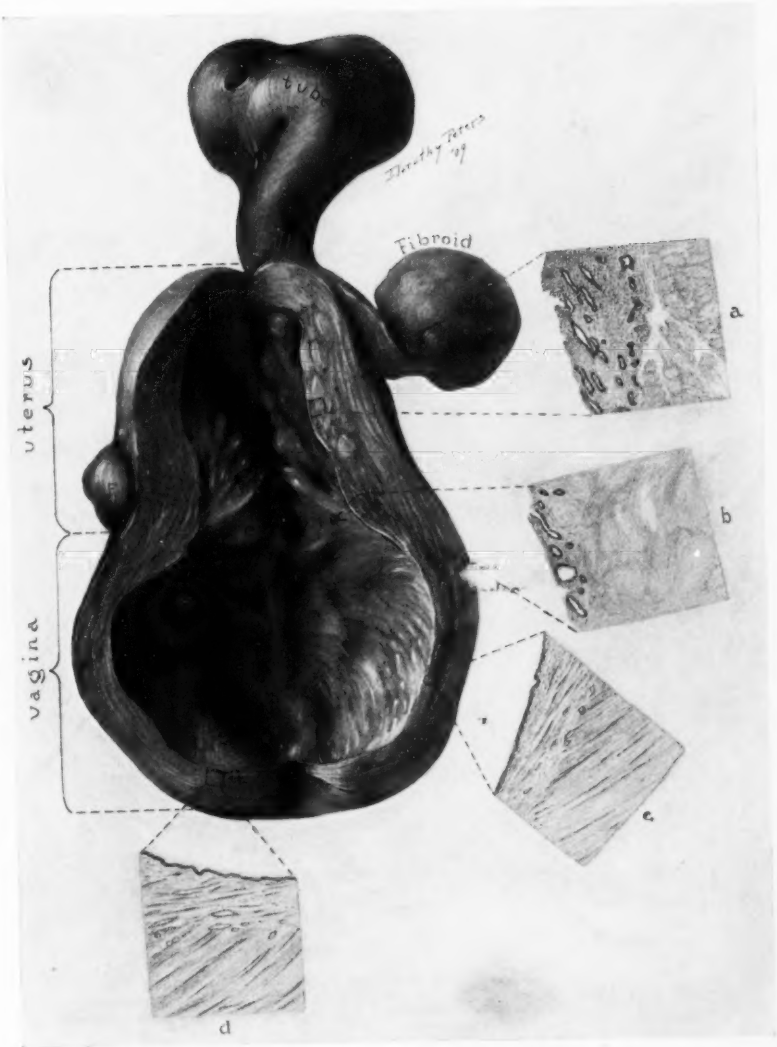
From the structure of the walls of the tumor it would appear that it had been one of long standing, although the immediate symptoms were acute for the past four or five months.

In a talk with the husband of the patient it was learned that the sexual act per urethram was accomplished at first with very little difficulty, and that coitus had always been gratifying to the patient. There had never been any incontinence of urine, and only a hint of cystitis at one time—six months before the first operation—when there was some frequency of urination, which disappeared after a short time.

Pathological Report by Dr. Wilson.—January 28, 1909, there was received in the pathological laboratory from the surgical service of Dr. W. J. Mayo, a specimen from Case No. 28914 the clinical data of which is detailed above by Dr. Guthrie.

The specimen consisted of an irregular ovoid mass 18 cm. in length and 9 cm. in its greatest transverse diameter. External examination showed the tumor to consist of what was apparently a distended uterus with closed cervix, and with but one tube and ovary—the right—attached thereto. Two small fibroids were present, the larger on the dorsal surface and the smaller on the ventral, both attached well toward the fundus. The tube and ovary were bound down to the fundus of the uterus as shown in

FIG. 2

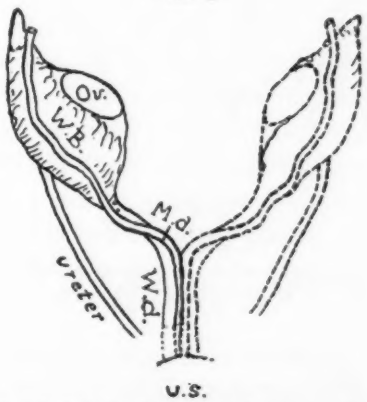


Two-thirds natural size, with sections 10-diameter magnification.

Fig. 1. Both were very much distended. The broad ligament on this side consisted of a contracted mass of adhesions. Numerous remains of adhesions were still attached to the organ, particularly where the fundus and tube had been attached to the liver, and at the lower portion, where attachments had connected it with the bladder. There was no evidence of ovary, tube, or broad ligament on the left side.

The specimen was opened longitudinally on the ventral surface, but well to the right of the median line. It was found to be tensely distended with blood—black, thick, and "tarry." The tube was filled with the same material as were also two or three cysts of the ovary, each of which seemed to be the remains of a much distended corpus luteum.

FIG. 3



Hypothetical embryological development, early stage. *Ov*, Ovary. *WB*, Wolffian body. *Wd*, Wolffian duct. *Md*, Mullerian duct. *Us*, Urogenital sinus. The dotted portions on the left side and at the lower end of the Müllerian and Wolffian ducts are those portions which are supposed to have remained undeveloped in the present case.

The lower porton of the tumor was more distended than the upper, and its walls were thinner and smoother. The upper half was fairly well marked off from the lower by an indefinite ridge, which suggested an imperfectly formed cervix.

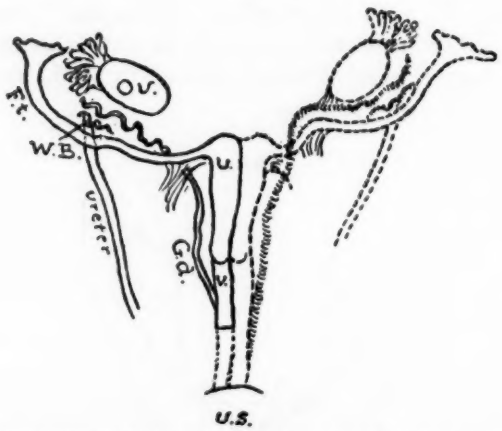
Microscopic examination of the mucosa from the upper portion of the tumor (Fig. 2, *a*, *b*) proved that this portion was uterus with thick walls, lined with tubular mucosa, not very different from that in the normal uterus.

The lower and thinner walled portion showed, microscopically, mucosa (Fig. 2, *c*, *d*) with flattened epithelium, such as is found

in the vagina normally. The walls of the vaginal portion, though thinner than those of the uterine portion, were still enormously thickened, when compared with normal vaginal walls. There was complete absence of the lower end of the vaginal portion.

The specimen would appear, therefore, to be the result of the development of the embryological elements of the right side only, with a destruction of the lower ends of these elements, resulting

FIG. 4



Hypothetical embryological development, later stage. Parts correspond to those in Fig. 2, except remains of Wolffian duct are designated, *Gd*, Gaetner's duct: *U*, uterus; *V*, vagina.

in a failure of the Müllerian and Wolffian ducts to unite with the urogenital sac. This hypothesis is further explained in the diagrams, Figs. 3 and 4, in which the parts represented by dotted lines are those which probably failed to develop. Such a hypothesis would account also for the absence of the left kidney and ureter. It is difficult to understand why there should have been a failure of the lower portions of the Müllerian and Wolffian ducts to develop, thus leaving the large space, probably 10 cm. between the closed end of the vagina and the perineum. Since the tumor was removed by the suprapubic route there was no opportunity to examine the intervening structures.

PERI-URETERAL PELVIC PHLEBOLITHS.*

BY GEORGE O. CLARK, M.D.,

OF BOSTON, MASS.

In the Röntgen Congress of 1905 the nature of certain small shadows, varying in number and in size from a shot to larger than a pea, occurring in X-ray plates of the pelvis about the spine of the ischium and the horizontal ramus of the os pubis, was discussed without being definitely settled.[1]

A recent writer claims they occur so frequently that in his six hundred pelvic radiographs of persons over forty years of age, it is the exception not to find some of these shadows.[2]

Similar shadows have been variously explained as being due to artefacts,[5] areas of calcification in the pelvic ligaments,[3] ossifications in the muscles,[1] intestinal concretions and foreign bodies,[6] appendiceal concretions,[7] phleboliths, and many other things. Instances are recorded of diagnoses of ureteral calculus based on such radiograph shadows, but at operation no calculus was found.[4]

M. G. H., autopsy 2207 (September, 1908), furnished a specimen (Fig. 1) which, because of its unusual character, led the writer to a special study of phleboliths, their possible bearing on the above-mentioned question, and their relation to the differential diagnosis of ureteral calculus.

During the last few years, literary contributions to the subject have been many, frequently contradictory, and, I believe, in no single instance comprehensive. To any interested members of the profession who have not the time to sit in judgment on all previous contributions to the literature, and to any others who may doubt the reality of phleboliths or their

*To Dr. F. A. Washburn, Resident Physician, M.G.H., to Drs. J. H. Wright and O. Richardson of the Laboratory of Pathology, to Dr. George B. Magrath, Medical Examiner of Suffolk County, and particularly to Dr. Walter J. Dodd, Radiographer, the writer is indebted for courtesy, material, and assistance.

ability to cast X-ray shadows, this existing state of confusion may serve the writer as an excuse for submitting this study of what at first sight might appear to be "much ado about nothing."

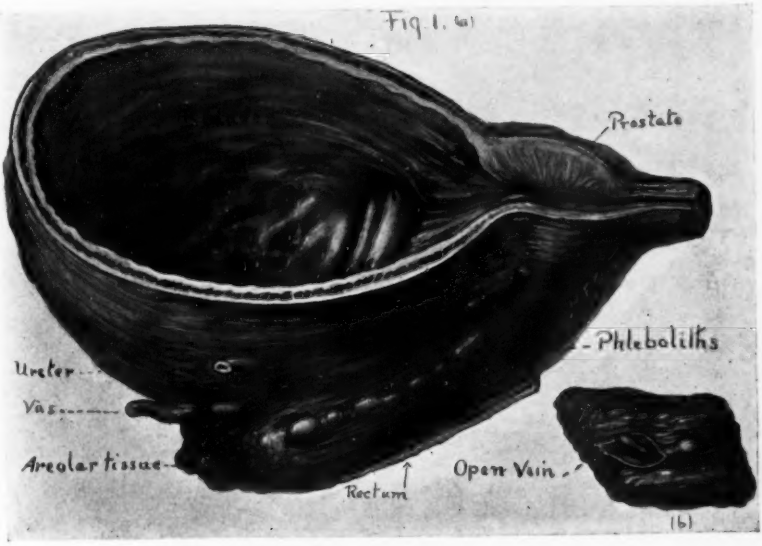
The writer's specimen consists of the male urinary bladder, ureters, prostate, seminal vesicles, rectum, and tissues immediately connected with the same, removed *en bloc* from a subject whose clinical history (M. G. H., 159,372) contains nothing worthy of note except, "Age, 78 years. Denies venereal disease. Osteomyelitis of left femur of some years duration. Recently, spontaneous fracture of same, necessitating amputation above the knee joint. Later, œdema of the lungs, death." Post mortem were found bronchopneumonia, arteriosclerosis, and the present specimen (Fig. 1).

The bladder is somewhat trabeculated, and, in the region of the trigone, shows evidence of a severe inflammatory process probably long since healed. The periprostatic or rectovesical venous plexus (abyrinthus venosus Santorini) shows bilaterally extensive thrombosis and within the vein lumen in different places eighteen phleboliths (Figs. 2 and 3), the heaviest separate veinstone weighing 150 mgm.

Though exact knowledge of the metamorphosis does not seem to be recorded, phleboliths are defined as having been originally white thrombi in veins which have subsequently undergone calcification,[10] analogous to arterioliths in arteries.[11] Examination of the present specimen accords with this view. In some parts of the plexus the veins are merely thrombosed, elsewhere the lumen is free. The thrombi exist in stages of metamorphosis varying from soft putty-like consistency to practically complete calcification. In other places the vein is represented merely by a string of fibrous tissue.

That portion of the thrombus actually calcified may be properly designated phlebolith,—it is of stony hardness, generally oval or round, but sometimes pear-shaped, of smooth but not always regular surface, yellowish white, and of variable size. Section reveals a grossly, homogeneous construction of alternating, more or less concentric strata enveloping

FIG. 1.

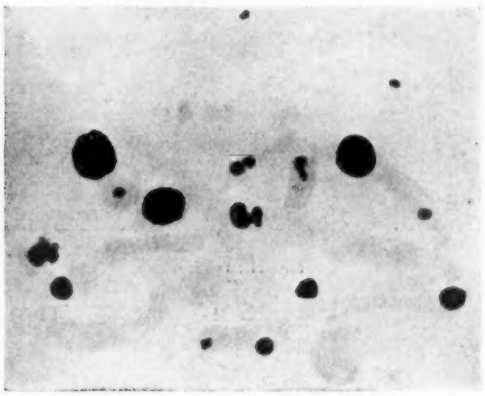


M.G.H., 159372.

FIG. 2.

Veins containing phleboliths and thrombi, from writer's specimen. Compare with Fig. 1 b. and Fig. 3.

FIG. 3.



Radiograph of Fig. 2. Note (1) relative atomic density of phleboliths and thrombi; (2) variation in size of phleboliths, in shape, outline, number, lamination. Compare radiographic appearance of phlebolith as actually existing (Fig. 3) with result of radiographing the same clinically (Figs. 4, 5, 6,), where lack of definition occurs.

a central kernel. Surrounding the phlebolith proper, and lightly in contact with or slightly adherent to the vein wall is an ever-present albuminous envelope representing not yet calcified thrombus. Where the vein stone is large this envelope is thin, tough, of yellowish-white color, easily peeled off the vein stone. Elsewhere, it varies in thickness, consistency, and color, so that it is sometimes more properly thrombus plus calcified centre, rather than phlebolith plus envelope.

It would seem that the process of calcification starts about a central nucleus or kernel and proceeds toward the periphery, since the size of the completed products varies from a millet seed upwards and since in no case can be found an outer calcareous shell enveloping an inner softer mass not yet calcified (see Fig. 3). On the contrary, all of the phleboliths have between their surface and the vein wall an albuminoid envelope not yet calcified. In no instance is a phlebolith found lying loose in the tissue, hence they are obviously of intravenous origin.

As late as 1908, a foreign radiographer of experience expressed doubt as to the actual existence of phleboliths, and wonders "why if these so-called phleboliths are responsible for the shadows so frequently met in pelvic radiography, they are not more common in the dissecting room."[2]

Reference to literature shows that the existence of phleboliths has been recognized by pathologists from an early date. They are recorded as having been found most "frequently" around the prostate and bladder in men,[10] in the plexus pampiniformis in women,[10] and in the spleen[14]; not uncommonly in the uterine veins,[5] sometimes in the saphenous veins; also in the mesentery.[6] Exact figures as to frequency of occurrence are wanting. That mention of such occurrence is not oftener made in post mortem records may be due to the pathologist's conviction as to their frequency and intrinsic harmlessness, and to his ignorance that a record of their existence or nonexistence could be of interest to any one. In fact, generally, he probably does not even search for them.

Perhaps this may partly account for the prevailing impression as to their rarity. Since the writer's attention has been directed to this question, he has during the last six months demonstrated the very frequent occurrence of phlebolith about the prostate of autopsied male adults. No instance is reported of phleboliths existing in childhood, nor of shadows in the pelvic radiographs of children attributable to phleboliths.[3]

In 1861, Balogh minutely described the microscopic and chemical examinations of a phlebolith weighing 120 mgm.—one of fourteen found at autopsy in the veins of the posterior bladder wall.[9] The mineral composition was found to be principally carbonates with a small amount of phosphates, calcium oxide, and traces of magnesium and iron oxide. Microscopically appeared corpora amylacea, blood corpuscles, and other cells in various stages of granular degeneration—all entangled in the meshes of coagulated albuminous matter representing the framework of the stony structure. In Balogh's patient malignant disease was the cause of death. This process he erroneously conjectured was the direct cause of the phlebolithic formation.

As to etiology, certainly the process of calcification is preceded by the existence of a nucleus,—in this instance a thrombus; but exactly what determines why one thrombus shall undergo resolution, another organization, and another calcification has not yet been conclusively proven. Pertinent factors predisposing to thrombosis are idiosyncrasy plus local venous circulation of a lowered or impaired degree, congestion, changes in the vessel walls from constitutional disease or from advancing age with its accompanying venous varicosities [16] and arteriosclerosis [18]; also phlebitis [15] and possibly inflammatory processes arising in neighboring structures.

The majority of such factors are conditions very frequently found in the adult pelvis and could account for the common occurrence of phleboliths in this region.

By appropriate bacteriologic technic, drill dust aseptically obtained from the cores of several sizes of vein-stones, separately tested, then planted in blood agar culture tubes and

incubated for forty-eight hours resulted in neither a positive growth nor the discovery of any bacteria in the stained smears obtained from the tubes. As to a possible bacterial etiology of phleboliths, such a result is. unfortunately, of very slight value and only negative at that.

Reports of positive symptoms during life caused by phleboliths *per se* the writer has not found. In fact, it is difficult to believe that such an innocent end-product of thrombosis could in itself cause venous obstruction, ulceration of the vein wall, or even appreciable pressure on a neighboring nerve with consequent irritation.

Nevertheless, these pelvic phleboliths are of very real importance from the chance they afford when present of being mistaken for something else of clinical concern. An intimate acquaintance with their characteristics will be of aid to both surgeon and radiographer, particularly in the interpretation of pelvic radiographs where the question of ureteral calculus arises; for of 30 subjects radiographed post mortem, Mr. Fenwick's radiographer found 8 that showed concretions in the pelvis other than ureteric calculi. In 7 phleboliths were present.[8]

In rectal and vaginal examinations a knowledge of their existence may help to explain some of the indefinite nodules sometimes entering consideration in the differential diagnosis of ureteral calculus, concretions in the bladder, in the prostate, in the seminal vesicles, in the lymph-glands, in peritoneal tuberculosis, other local tuberculosis, and possibly cancer.

In the course of a prostatectomy, either suprapubic or perineal, should some of these phleboliths be encountered, an attempt to worry them out of their vein sheaths could result in no good and would very likely increase hemorrhage.

To ascertain facts as to the actual appearance in a radiograph of phleboliths, the following experiment was done. A male cadaver was obtained and from it removed everything which might be expected to cast a shadow representing any sort of substance not anatomically a normal portion of the bony pelvis. In proper anatomical position was then anchored

en bloc the specimen of bladder, prostate, rectum, seminal vesicles, phleboliths undisturbed as they existed in the vesico-prostatic plexus, and the ureters, each containing a fine metal probe. The pelvis of this cadaver so prepared, and the abdominal incision closed, was then radiographed as if it were a living patient suspected of having ureteral calculus (Figs. 4, 5 and 6).

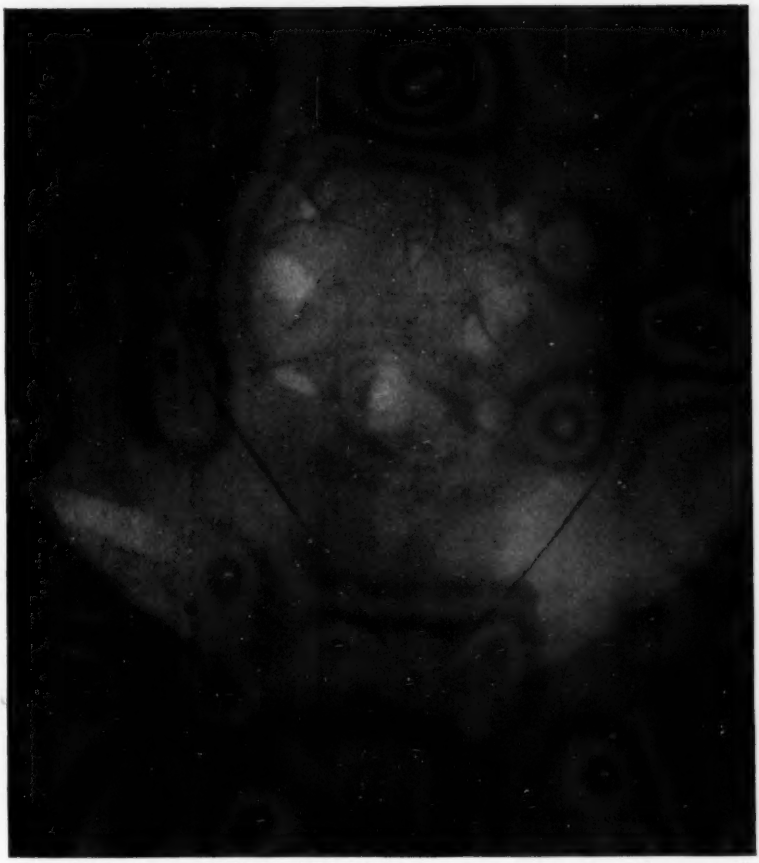
It proved conclusively that: (1) Experimentally, a phlebolith may cast a shadow in an X-ray plate; (2) Conversely, that clinically, shadows seen in a pelvic radiograph may be caused by the presence in the patient of phleboliths.

Further is to be observed that: (1) The area of their distribution may embrace the pelvic course of the ureters; (2) The number may vary—they are characteristically multiple and bilateral; (3) Where multiplicity occurs, lines drawn on the plate connecting the shadows are apt to give a line at variance with the course of the ureter; (4) The size of the shadows varies from minute to as large as what could cause ureteral obstruction if situated within the ureter (see Fig. 3); (5) Their outline in the clinical radiograph is generally regular and their density even, contrasting with the less definite and generally irregular or angular outline of a true calculus shadow. (The concentric lamination markings of the vein stones as seen in Figure 3 are lost in the clinical radiograph and the appearance of the shadows suggests the comparatively homogeneous chemical consistency of the vein stones (see Fig. 4, 5, 6), in contrast to the frequently varying composition of urinary stones, where the component salts vary and present corresponding variations in the shadow because of the different degrees of atomic density.)

Where, in addition to, or in place of employing Kelly's wax-tipped ureteral bougie, the X-ray is used to further diagnosis, even then casually to diagnose as ureteral calculus a shadow seen in a pelvic radiograph is obviously to invite possible disappointment,[8] as instances of fruitless operations based on such diagnoses are recorded.[4, 5]

To state positively the cause of a given radiographic

FIG. 4.



Phlebolith and ureteral indicator fall in the same anteroposterior plane. Compare with Fig. 5.

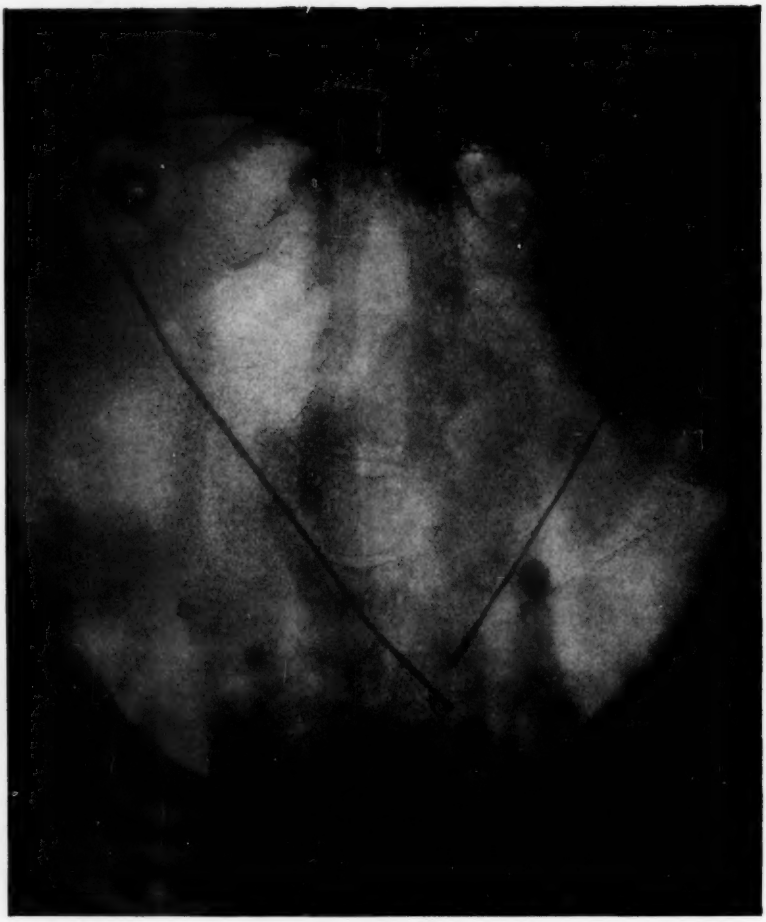
FIG. 5.

By shifting the X-ray tube the "suspicious" shadow appearing in Fig. 4 is shown to be extra-ureteral.

FIG. 4.

Phlebolith and ureteral indicator fall in the same anteroposterior plane. Compare with Fig. 5.

FIG. 5.



By shifting the X-ray tube the "suspicious" shadow appearing in Fig. 4 is shown to be extra-ureteral.

Fig. 6.

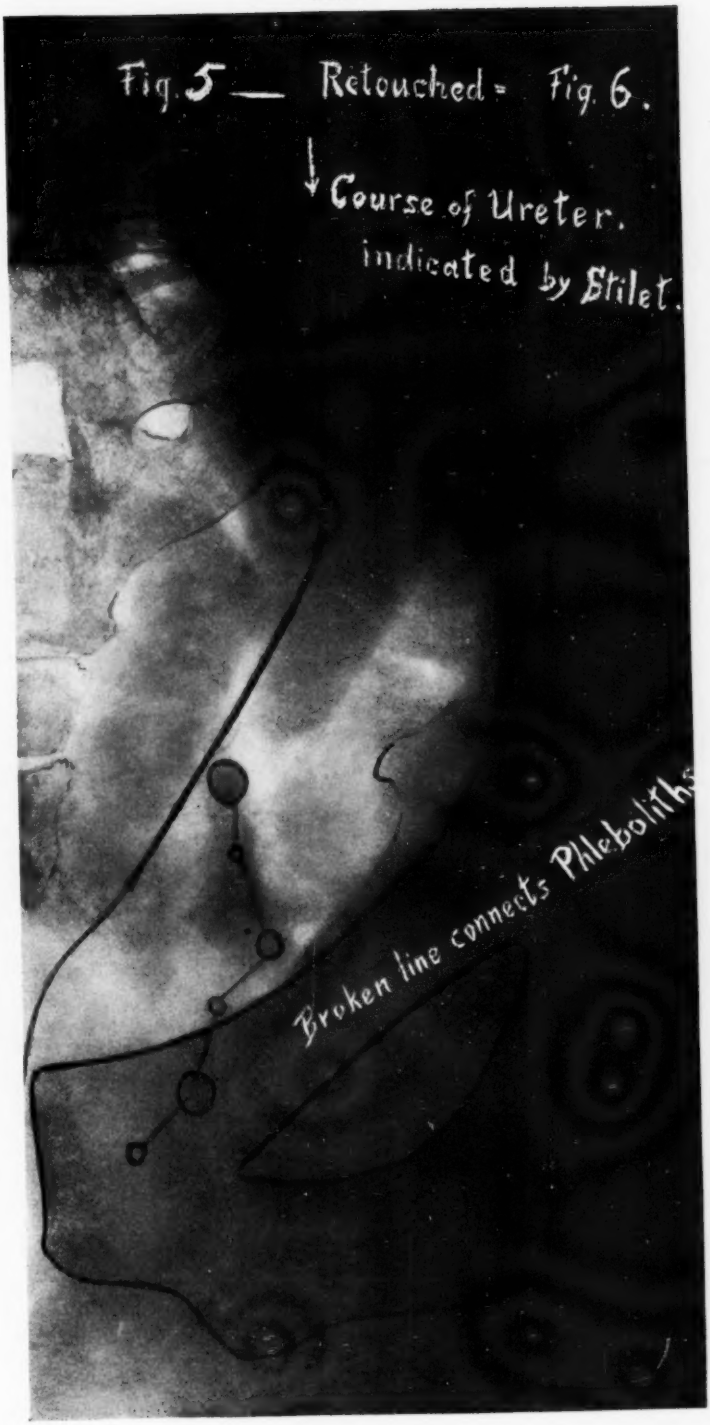


Fig. 5 — Retouched = Fig. 6.
Course of Ureter.
indicated by Stilet.
Broken line connects Phleboliths

shadow may be very difficult in many cases. Practically, what we primarily seek definitely to establish as regards radiography in a case of suspected ureteral calculus is whether a given shadow is of intra-ureteral origin, or extra-ureteral,—in the latter instance due to any one of many possible causes in themselves perhaps of only academic interest.

Kolischer and Schmidt [17] devised bougies bearing metal cores for insertion in the ureters previous to radiography. Their experiments on the cadaver showed the feasibility of applying this method clinically to ascertain the relationship between a suspicious shadow and the ureteral course as indicated in the radiograph.

Reichman [18] reports the case of a patient suffering from unilateral colic clinically indistinguishable from the ureteral variety. The X-ray plate showed a corresponding shadow, and operation was advised. A radiograph taken after introducing ureteral stiletted bougies showed the suspected shadow to lie 2 cm. outside the ureter's course.

In spite of this technic, it is possible to be misled in case the suspected shadow and that of the bougie lie in the same anteroposterior plane (see Fig. 4). Albers-Schönberg has called attention to this fact and showed a radiographic illustration. In his case the suspected shadow was in reality due to a concretion in the uterine plexus 6 cm. away from the ureter.[1]

To demonstrate the relationship of bougie and suspected shadow in such instances, it has been suggested that the patient or the lamp be shifted to vary the path along which the rays travel through the suspected object to the plate.[3] Stereoscopic radiography has been employed.[8] The effects of shifting the light are seen in Figures 4 and 5.

Caldwell states stereoscopic X-ray plates have proven of little value unless the course of the ureters is outlined by the shadow of the ureteral catheter.[19] With such technic he has demonstrated ureteral calculus to be in contact with the ureteral bougie.

The procedure of introducing ureteral bougies is not without its own peculiar risk. This risk naturally varies depending

on the conditions existing in the patient as well as on the special qualifications of the operator. From the writings of Albarran, Israel, Casper[20] and others,[21] the writer believes that this procedure as employed by experts is attended by no appreciable risk either transitory or lasting. For the technic of ureteral catheterization or bougieing—the indications and contra-indications—the reader is referred to the extensive bibliography chronologically arranged by Ricketts.[22]

Summary.—1. Phleboliths have been recognized by pathologists for centuries as realities.

2. They occur frequently in the periprostatic veins of men and in the plexus pampiniformis of women, varying in size and number.

3. Symptomless in life, and requiring no treatment, they may be discovered only post mortem or in the course of rectal, vaginal, or radiographic examination.

4. In pelvic radiographs they cast small shadows about the spine of the ischium and horizontal ramus of the os pubis, frequently in the course of the pelvic ureter. (*a*) Characteristically, these shadows are multiple and bilateral, but the number and site may vary. (*b*) Frequently the size of birdshot, they may be as large as what could cause ureteral obstruction if intra-ureteral. (*c*) Shape, generally round or oval, may be slightly irregular. (*d*) Density, in contrast to usual ureteral calculus shadows, evenly rendered. (*e*) Where multiple, lines connecting the shadows may show an axis at variance with the ureter's course (Fig. 6).

5. Familiarity with these characteristics will enable the interpreter of a pelvic radiograph to identify, in most cases, certain shadows as being cast by phleboliths.

6. In other cases they may so obscure diagnosis of ureteral calculus that before facts are definitely ascertained it will be necessary to resort to repeated X-ray exposures, varying the relative positions of light, patient, and plate; ureteral bougieing previous to radiography, possibly to stereoscopic X-raying with bougies *in situ*.

7. Suitable technic exists to make certain, without undue

risk, in practically all patients suspected of having calculus in the pelvic ureter the intra-ureteral existence or nonexistence of the substance causing a given shadow.

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CYST OF THE PROSTATIC URETHRA.

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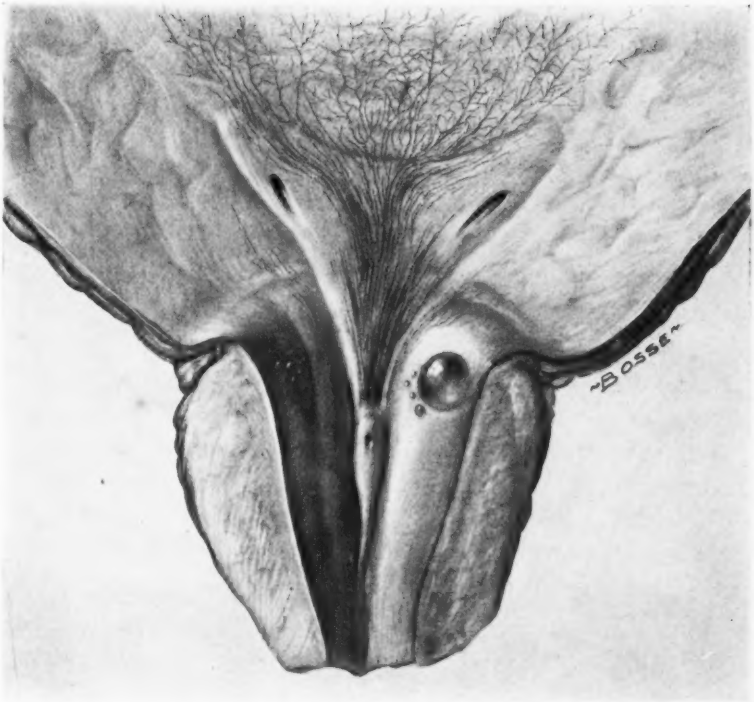
In the course of a histological and anatomical study of the posterior urethra, we recently encountered a specimen of prostatic cyst, or cyst of the prostatic urethra, which, because of its rarity, deserves a short mention. It was found at autopsy in a man, 38 years of age, who had died of peritonitis.

Situated about 8 millimeters below the margin of the internal sphincter, on the left side and at the junction of the anterosuperior with the posteroinferior urethral wall, we found a tense cystic body, projecting into the lumen of the urethra. Its hemispherical surface was formed by extremely thin glistening mucous membrane, which by virtue of the color of the fluid content gave a greenish yellow sheen. The cyst measured about 6 millimeters in diameter, its highest point being elevated about one-half a centimeter above the level of the surrounding mucosa. Just medial to it, a few tiny pinhead-sized glistening points indicated the presence of similar but much smaller fluid collections. At a corresponding site on the right side there were the beginnings of minute cyst formations. None of these lesions were placed in the region of the openings of the prostatic ducts, but a fair distance above (cephalad) and to the outer side of these.

Upon opening the thinned wall of the cyst, thick, mucoid, green-yellow fluid escaped. A close inspection of the cavity thus exposed revealed the fact that the intraprostatic extent was far less than was indicated by the intra-urethral protrusion, the cyst having developed towards the mucosa rather than into the denser connective and muscular tissues of the prostate. The fluid was found to contain a very few cellular elements in the shape of desquamated, degenerated epithelial cells, and some granular detritus. There were no corpora amylacea.

FIG. 1.



Prostatic urethra opened anteriorly, exposing the large cyst near the vesical sphincter.

FIG. 2.

The irregular bay in the upper left-hand part of the photograph represents a portion of the deep wall of the large cyst.

FIG. 3.

Section showing one of the smaller cysts.

In Fig. 2* a small portion of the opened and very much shrunken prostatic wall of the cyst is shown. It is lined by two to three layers of compressed epithelium, and has apparently had its beginning in the subepithelial layers of the prostatic urethra. Its growth into the prostate is very slight, and its extension has occurred mainly in directions parallel with the mucous membrane, the central portion of which has been lifted up in the lenticular manner depicted in Fig. 1. The intraprostatic portions of one of the smaller cysts is to be seen in Fig. 3.

A review of the literature bearing on this subject has convinced us that in our specimen the location of the cyst is unique. Although Morgagni had already mentioned the occurrence of cysts in the prostate, these must be rather uncommon, for, excepting those that are the results of retention in the hypertrophic organ, very few cases with accurate pathological descriptions have been recorded. Englisch found that closure of the orifice leading into the sinus pocularis not infrequently gives rise to retention cysts in the new-born, that micturition may be prevented by obstruction to the vesical outlet, but that spontaneous cure usually takes place on the second or third day of life, by reason of the rupture of the cyst. Springer has reported that this lesion of the utriculus is found in the adult and he describes three such cases and a fourth in a boy of one year and nine months old.

A rarer site is the *pars supramontana*. Englisch saw a hemispherical tumor about 1½ centimetres in diameter just at the middle of the posterior half of the internal sphincter, and attributes its formation to dilatation of aberrant prostatic glands. Socin and Burckhardt were able to diagnosticate a similar tumor with the cystoscope, and removed it successfully. They also record the finding of a cyst of the prostatic urethra at autopsy of a man, 59 years of age who never had any urinary symptoms. The tumor is said to have been situated on the right side of the posterior wall of the vesical neck, was about the size of a pea, and contained clear serous fluid.

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*The photomicrographs were prepared by Dr. F. S. Mandlebaum, director of the Mount Sinai Pathological Laboratory.

In our case we are dealing with a small retention cyst evidently arising from glands of the prostatic urethra in a part of the canal that is normally sparsely supplied with glandular elements. The dilatation in the immediate vicinity of the larger cyst, and the similar changes on the opposed wall, point to the existence of glands that may be regarded either as abnormal prostatic or enlarged glands of the urethral mucosa.

It is unfortunate that we were unable to obtain data that might have enlightened us as to whether the lesion had caused any symptoms. Nevertheless, it is clinically of interest to note the possibility of the presence of such cysts, and to theorize as to the manifestations that these could produce either by rupture or by interference with the normal action of the vesical sphincter.

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INTERILIO-ABDOMINAL AMPUTATION.

WITH REPORT OF A CASE.

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My reasons for presenting this paper are that the case report which gives it foundation is the third of its kind to be recorded in the United States, and I feel justified in counting it among the operative successes. Had Billroth's interilio-abdominal amputation performed in 1891 been a success, it is quite certain that it would not have remained unknown for eleven years, to be recorded finally on verbal testimony alone. If a name is to be attached to the operation it should be that of Jaboulay of Lyons, who in three years had three opportunities of performing it. He reported no successful operation, and only one of his cases survived the fourth day.

The case which I beg to report is the following.

James F., colored, æt. 45. Was admitted to the Cincinnati Hospital September 29, 1908. The family history is negative. There is a history of an initial lesion twenty years ago, and of repeated attacks of gonorrhœa. Six years ago the patient was kicked in the right hip by a mule. Three years later he noticed a swelling in the right groin, which, gradually increasing in size, caused a swelling of the foot and leg. He entered the hospital the first time February 18, 1908, for this swelling in the groin.

Examination on admission showed the patient to be normal, save for the inguinal swelling and the œdema of the leg. The swelling in the inguinal region was the size of two fists, very hard and attached to the ilium. The tumor was painless. The femoral vessels were displaced forwards. On the inner side there were several distinct and isolated inguinal glands about the size of a pigeon egg. Hip movements at this time were not impaired except in abduction. The entire extremity was œdematous.

On February 24, 1908, the bony tumor was removed by Dr. E. W. Walker. The laboratory report showed the tumor to consist of cancellous bone with no evidence of malignancy, but a slight round-celled inflammatory infiltration into a portion of it. Recovery from this operation was seemingly complete. The result was good and the patient left the house May 2, 1908; has been at work at common labor until two weeks ago, September 12, 1908, when an abscess in the region of the former tumor ruptured. The discharge has been very free ever since.

Status Præsens: September 29, 1908. Head, neck, chest, and abdominal examinations negative. The right leg much larger than normal, from œdema. Little or no motion in the hip joint. Bony proliferations are felt on the right pelvis and the upper part of the shaft of the femur, and about the trochanter. There is a fluctuating painless mass on the inner side of the ankle. A sinus at the site of the former operation leads to exposed bone. It radiates in various directions. Pus channels have been formed all along the anterior part of the thigh. The general condition of the patient is not good; his appetite is poor, the pulse rate is fast and there are irregular elevations of temperature. The patient is septic.

On October 5, 1908, a long incision was made on the front of the thigh for drainage, and a large piece of necrotic bone removed. From this time on the wounds were irrigated two or three times a day and packed with gauze. From time to time the local treatment varied, iodoform and bismuth injections being used. The patient's condition failed to improve, the discharge continuing very free and foul.

X-rays taken of the patient show a tumor the size of a fist, involving the iliac bone, the upper end of the femur and the tuberosity of the ischium.

December 28, 1908. The wound was enlarged under local anæsthesia and curetted for better drainage. Before this was done, an amputation was highly recommended to the patient, but he refused. From this time forth a typical septic course continued.

From day to day the evening temperature rose from one and a half to three degrees; the pulse fluctuated between 90 and 110; night sweats were frequent and the patient was bedridden. From a number of sinuses on the anterior and outer portions of

the thigh and gluteal regions large quantities of pus were being discharged, notwithstanding the use of frequent irrigations. It was in this condition that as a last resort an interilio-abdominal amputation was done.

Operation, March 8, 1909. Ether anæsthesia. Esmarch bandage applied to the entire leg to preserve its blood for the patient. The right common iliac artery was next tied through a median abdominal incision. On account of the numerous sinuses in the region of the trochanter and over the gluteal mass, it was possible only to make use of an internal flap. The first incision was made a little below the crest of the ilium and Poupart's ligament, from the posterior superior iliac spine to the centre of the ligament. The incision was continued through the various layers of soft parts until the fascia transversalis was reached. In doing this a number of sinuses with exceedingly indurated walls and dense cicatricial tissue were cut through. Nevertheless, the fascia and underlying peritoneum were reflected without opening the abdominal cavity until the brim of the true pelvis was exposed for nearly its entire length on the side affected. The next step of the operation consisted of making the long internal flap, the incision beginning at the centre of Poupart's ligament and coursing down the anterior surface of the thigh and terminating with a long curve in the posterior incision which terminated above at the point of starting. This long internal flap was quickly dissected from the surface of the femur with very little bleeding. With a very broad chisel the iliac bone was next divided in front of the sacro-iliac joint, the cut being rapidly made from the crest to the sciatic notch. An inch to the outer side of the symphysis the chisel was next applied and driven to the thyroid foramen. It was similarly used to cut through between the ischium and pubes. I am sure that the use of the chisel greatly shortened the time of the operation. On the other hand, the forceful blows necessary to cut through the bone were associated with shock, as evidenced by the rapid fall of blood pressure. At this time an intravenous transfusion of normal salt solution, for which preparation had been made, was given. The removal of the lower extremity with the resected part of the iliac bone in one piece was then very quickly accomplished with a few strokes of the knife. During the operation the patient did not loose more than a few ounces of blood, and most of this, strange

as it may seem, came from the femoral artery when it was divided. Doubtless the anastomotic circulation with the other side had been very free. I have recently seen the same free bleeding from a divided femoral artery immediately after the common iliac was tied. We encountered no enlarged glands in the operation. The wound was closed with buried muscular sutures and ample drainage for the many and irregular sinuses and thick walled pus cavities encountered in the course of the operation. The patient left the operating table in very fair condition.

The subsequent history was that of a continuous and unequal struggle with the sepsis present before the operation. As has occurred so often where the long internal flap was used, gangrene of the wound margins developed in two or three days and necessitated removal of many of the sutures. The repair power of the patient was at a minimum. The use of streptolytic serum especially prepared failed to make any impression on the septic condition. An enterocolitis, septic in character, developed four weeks after the operation and could not be controlled.

The autopsy revealed caseating pulmonary tuberculosis, acute toxic nephritis, myocardial degeneration, and advanced fatty degeneration of the liver. The clot in the common femoral was well organized. The wound in the peritoneum over the artery where it was tied could scarcely be found.

An examination of the specimen which I beg to present and of which I submit X-ray plates, showed it to be, in my judgment, an osteosarcoma (Fig. 1).

The following is the report of Dr. Marion Whitacre.

Specimen presented for examination consisted of upper end of femur, the hip joint and a part of the pelvis.

After removing the soft parts, the tumor mass seemed to be very hard, not bony hard, as the surface seemed to be made up of a dense tissue almost of a cartilaginous tissue. There were sinuses extending into the growth at various places from which a purulent fluid ran when the packing was removed.

Small pieces were taken from various parts of the growth in the soft parts above mentioned for microscopic examination, the report of which will follow. The tumor mass was then sawed in two, the endeavor being to pass through the head of the bone and at same time get a good view of the tumor growth. Small pieces of bone were taken at different places for examination.

FIG. 1.

X-ray plate. Osteosarcoma of pelvis.

The specimen gave the appearance of being a hard osteoma surrounded by a large amount of chronic inflammatory matter.

MICROSCOPIC EXAMINATION.—The sections of the hard fibrous tissue were made up of a large amount of dense connective tissue with considerable evidence of degeneration in places. Other places showed a rather vascular condition with considerable evidence of acute inflammation in the presence of leukocytes throughout the tissues. At one or two places the sections showed distinct evidence of sarcomatous growth in the presence of large number of round and spindle cells. The blood-vessel walls were very poorly formed, many of them being made up of the cells of the tumor. There was also evidence of capillary hemorrhage in places.

The bony section after decalcification showed for the most part a hard cancellous bony growth, but on one side showed evidence of the invasion of the sarcomatous elements. The trabeculæ of the bone were invaded by a connective tissue growth, which were of the spindle shape.

From the examination, I should be inclined to think that the growth was originally an osteoma surrounded by a considerable area of inflammatory tissue, and that the mass on one side had undergone a malignant change and this had also invaded the bone, thus giving the diagnosis of osteosarcoma.

The indications for interilio-abdominal amputation have thus far been neoplasms of the upper end of the femur and of the pelvis and intractable tuberculous coxitis involving the acetabulum and iliac pan. In regard to prognosis these cases should be separately classed according to the nature of the disease, whether tumor or tuberculosis. A further division should be made between the operation done in one stage and those in which after a varying interval the amputation at the hip is followed by a more or less extensive resection of the innominate bone. I have endeavored in the following tables to record all of the operations hitherto published. Of the total number, thirty-four cases, nineteen were tabulated by Keen and Dacosta in 1904.

TABLES.

It will be seen from Table No. 1 that the postoperative mortality of this amputation "the most extensive operation in all the realm of surgery," is 68 per cent., counting the cases of death after twenty days with the operative recoveries. In this I have followed the lead of Keen. In the cases where

the resection of the pelvis was preceded by amputation at the hip, no deaths followed the second operation. From this it might be inferred that this course is preferable as a routine procedure. Unfortunately, in tumors of the pelvis, the two-stage operation is not feasible, and in those for tuberculosis none other is ordinarily applicable. In the case recorded by Freeman, the amputation at the hip was immediately followed by resection of the pelvis. The extent of the disease was evidently not apparent until the hip-joint amputation had been done. In the cases of Girard and Pringle the second operations were made for recurrent disease after disarticulation at the hip.

Doleful as are the immediate results of interilio-abdominal amputation, the end results have been even more unpromising. The cases of Girard classed with recoveries, died within six months of recurrence. Pringle's case died in five months with metastases. Salistcheff's case was reported well within four months of the operation. The end result I do not know. The record case is probably that of Freeman. Although he left the anterior third of the acetabulum and of the ilium, the case belongs in the category of interileo-abdominal amputation. Freeman's case was well at the end of sixteen months when reported, but died twenty months after operation from recurrence in the abdominal wall (personal communication). Of the end results of the operation for tuberculosis, the data are extremely meagre. The case of Bardenheuer gained in health and strength four months after the operation, and it is presumed was a permanent recovery. The case of Pringle was without recurrence seven years after the operation.

In the face of these unpromising results, it may be questioned whether the operation is justified. The same question has been put for every major operation in surgery, and has in the course of time with unvarying uniformity been answered affirmatively. By limiting the operation to suitable cases and performing it at a time when there is at least a probability that the patient can bear the shock connected therewith, it is almost certain that the prognosis will improve as it has so

markedly for amputation at the hip. Disseminating the knowledge that the operation is feasible will, by bringing the cases earlier to the surgeon, contribute much towards this desirable end. With two exceptions, I know of no text-book in which the operation is even mentioned.

In an operation of such magnitude, the initial mortality is largely due to hemorrhage and to shock. Of all the cases that are not included under postoperative recoveries, only two survived the fourth day. The prevention of hemorrhage has in most of the cases been sought by preliminary tying of the common iliac, the internal iliac or the external iliac. Many believe that the tying of the corresponding veins ought always be practiced. Kocher and Kadjan encountered severe venous bleeding. Tying of the thin-walled large veins doubtless would increase the difficulties of the operation. Faure, after a median laparotomy, applied a temporary ligature to the aorta just below the common iliac. Nevertheless, a severe venous hemorrhage from subcutaneous and subperitoneal veins necessitated abandonment of the operation. Nanu, Jaboulay, Cacciopoli, and Salistcheff also ligated the common iliac. Bardenheuer tied both the external and the internal iliac vessels. Freeman tied the external iliac and, later in the operation, the common iliac. Keen tied the internal iliac artery. That by the tying of the common iliac artery preventive hæmostasis can be accomplished, has been amply demonstrated in the case reported, and it was most satisfactory. Unfortunately where a long internal flap is, as in our case, a matter of necessity, there is great danger of gangrene. This had already commenced in Keen's case, although the patient lived only thirty-three hours. The gangrene strangely developed in the superior flap and not in the margin of the long internal. In my case the gangrene involved the long flap only. Were a similar case to come under my observation, I would tie the external iliac and the posterior trunk of the internal. In that manner the obturator artery would be left intact for the nutrition of the long internal flap.

What promises to be a decided addition to our methods of

preventive hæmostasis is the method of Momburg. He encircles the abdomen below the costal border with three or four turns of a tourniquet, thereby controlling the circulation through the aorta itself. It seems that in the cases thus far cared for in this manner no harm has come to the viscera. It would seem, however, that the placing of the strap in such close proximity to the wound margin might make one feel that it would slip after the amputation is completed. This objection, it must be confessed, is a theoretical one on my part. It has been answered by a successful operation done by Bier, where the strap was kept in place for eighteen minutes.

The prevention of shock is a further desideratum. In our case there was no manifestation of shock until the chisel was used. While the use of the chain or wire saw may minimize this shock, it cannot in this way be entirely overcome. In a future case I should attempt the operation under spinal anæsthesia, which method was used by both Bier and Pringle with success. At all events, I should use the lumbar anæsthesia in conjunction with the general.

In regard to the amputation proper, there comes the question as to the extent of the pelvic bone to be removed. In the earlier cases the entire innominate bone from synchondrosis to symphysis was removed. One should be guided in this matter by the extent and site of the disease for which the operation is performed. Most of the primary tumors of the innominata spring from the iliac pan or the tuberosity of the ischium. Where it is possible, the ramus of the pubes and of the ischium should be left, since they give attachment to the rectus muscle and the corpus cavernosum. The likelihood of a hernia would be lessened.

In regard to the method of operating, writers differ. Where it is possible, a disarticulation at the hip may with advantage, as was done by Bardenheuer and Freeman, immediately precede the resection of the pelvis. A glance at the X-ray plate of the specimen removed in my case, shows that this procedure would have been unfeasible. This is true probably of the majority of cases of sarcoma springing from

the pelvis. In this regard, as in that of securing adequate flaps for covering the extensive wound, every case must be considered on its own merits. This is doubtless the reason why so many methods have been devised for the interilio-abdominal amputation.

The original operation of Jaboulay consisted of making one large posterior flap. The first incision was made from the symphysis parallel to and over Poupart's ligament and the entire length of the iliac crest. By retracting the upper wound margins the soft parts are lifted from the iliac fossa and the vessels easily reached for tying. A circular incision is next made at the upper third of the thigh, through the centre of which on the anterior surface the two incisions diverge towards the pubes and the iliac crest. Thus a very large posterior flap is left which completely and easily covers the wound.

Girard operated in three cases by making internal and posterior flaps. Bardenheuer formed external and internal flaps, and Salistcheff in his successful case operated by the racquet method. He begins his incision below the twelfth rib and passes over the anterior superior spine of the ilium to Poupart's ligament, which it follows to the pubes. Through this incision the vessels are secured. The wide end of the racquet incision sweeps over the internal surface and back of the thigh and over the buttock to the point of starting. The simplest method, from an operative standpoint, is that of the long internal flap, the method of Savariaud slightly modified by Keen and adopted by me. It has the signal disadvantage of having to be exceedingly long to cover the wound. The risks of gangrene I believe to be larger after this operation than after any other. Where it is feasible, it appears to me that the incision of Salistcheff has superior advantages.

Interilio-abdominal amputation must always remain a desperate operation. It should never be resorted to where a less mutilating procedure is possible. Partial resection of the os innominatum for tumors of the iliac pan ought to be per-

formed in preference to the interilio-abdominal amputation. Strange as it may seem, the three complete hemipelvic resections performed by Kocher (2) and Roux (1) all recovered. Whereas according to Croisier, of the partial resections there were eight deaths and seven operative recoveries. It is needless to add that these conservative operations have a place only for limited neoplasms. So far as the usefulness of the ilium is concerned in hemiresection of the pelvis, there has been less impairment of stability and usefulness than one might imagine. In the cases of interilio amputation that have survived, there has been no tendency towards eventration, a condition which one would judge to be a certainty after removing so much of the bony support of the abdominal viscera.

TABLE I.—OPERATIONS IN ONE STAGE FOR SARCOMA.

1. Billroth (1891). Death in a few hours. Verbal communication, Savariaud, Rev. de Chir., vol. xxvi, p. 350.
2. Jaboulay (1894). Death in 36 hours. Lyon Méd., 1894, p. 507.
3. Jaboulay (1895). Death in 24 hours. Province Méd., 1896 (Pringle).
4. Jaboulay (1895). Death in 5 days. Girard, verbal communication (Pringle).
5. Cacciopoli (1894). Death in 3 hours. Cent. f. Chir. (quoted), 1894, p. 988.
6. Gayet (1895). Death in 1 hour. Province Méd., 1894, No. xxxv.
7. Girard (1895). Recovery. Congrès Chirurg., 1898.
8. Faure (1899). Operation abandoned. Savariaud, Rev. de Chir., vol. xxvi, p. 365.
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14. Morestin (1902). Death in 9 hours. Bulletin Arch. Gen., 1903, vol. cxii, p. 1665.
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16. Keen and DaCosta (1903). Death in 33 hours. Internat. Clinics, vol. iv, Series 13.
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22. Ransohoff (1909). Recovery. Lived 38 days.

* In a personal communication Professor Bier informs me that his patient died two months after operation, of recurrence in the abdominal wall.

TABLE II.—OPERATIONS IN TWO STAGES FOR SARCOMA.

1. Girard (1895). Amputation at hip. Some months later resection of pelvis. Recovery. Rev. de Chir., vol. xxvi, p. 365.
2. Pringle (1908). Amputation at hip. Death 6 months after resection of os innominatum. Lancet, Feb. 20, 1909.

TABLE III.—AMPUTATIONS FOR TUBERCULOSIS.*

1. Girard (1895). Died in 50 minutes. Rev. de Chir., 1898, p. 1141.
2. Bardenheuer (1897). Recovery. Gesellsch. d. Chir., xxvi, l, p. 130.
3. Gallet (1900). Died in six hours. Gesellsch. d. Chir., xxvi, 1, p. 130.
4. Ribera (Madrid) (1902). Died, collapse. Luis y Simon, Siglo Med., 1903, vol. v.
5. Ribera (1902). Died 8th day. Luis y Simon, Siglo Med., 1903, vol. v.
6. Ribera (1902). Died, collapse. Luis y Simon, Siglo Med., 1903, vol. v.
7. H. Vermeuil (1905). Died in 2 hours. Jour. de Chir. (Belge), vol. v, p. 406.
8. Morestin (1908). Recovery. Bull. Soc. de Chir., Paris, vol. xxxiv, p. 1060.
9. Pringle (1908). Recovery. Lancet, Feb. 20, 1909.
10. Pringle (1908). Death on 1st day. Lancet, Feb. 20, 1909.

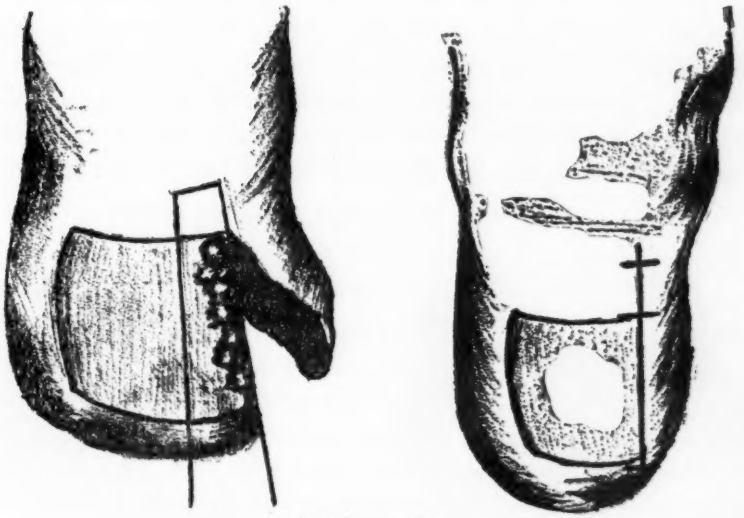
* The operations for tuberculosis were practically all done in two stages, the first being either a hip resection or amputation. The extent of the resection of the pelvic bone varies much. I have, however, excluded all cases in which the resection did not involve the major part of the ilium.

A NEW OPERATION FOR INGROWN TOE-NAIL.

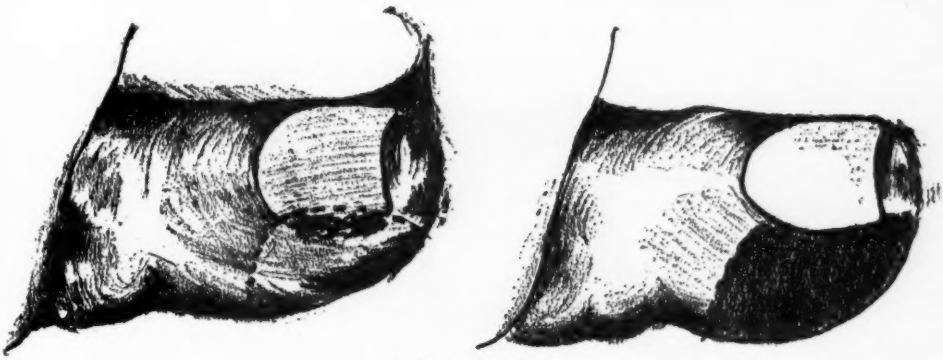
BY S. D. VAN METER, M.D.,
OF DENVER, COLO.

ONE feels considerable delicacy in claiming anything new in surgery, because it has been well said that "there is nothing new under the sun"; but, so far as I have been able to determine by a careful review of surgical literature, the following operation has not been published, although it is more than probable other surgeons have resorted to the principles involved. That it has not been recognized by the authors of the three most recent publications on surgery, is further justification of my claim to its novelty. Of the numerous operations advocated for ingrowing toe-nail, the operations of Anger, Cotting and von Bergmann are recommended as the best. It is admitted that the majority of cases can be cured by proper dressing, and the appliances, such as are suggested by Taylor and Webb, are of signal assistance in curing this condition without a cutting operation. The unwillingness of the patient, however, to submit to treatment often renders it advisable to perform a radical operation, although we know that with a little patience we shall succeed in effecting a cure without surgical interference.

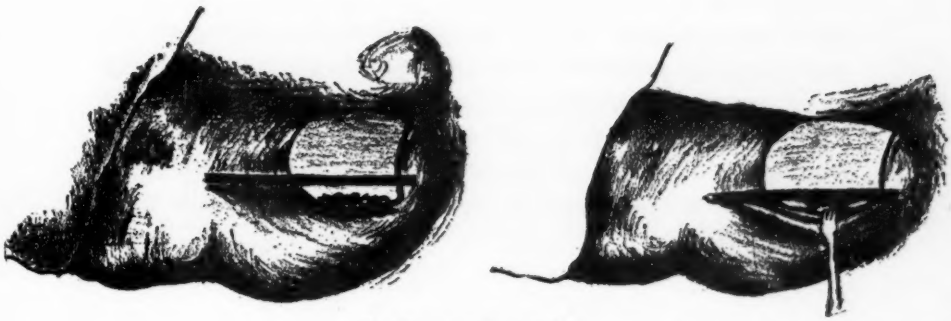
The operation I have devised, and which I find most satisfactory, may be described as follows: After the usual cleansing preparation, and a thorough application of Harrington's solution, a diamond-shaped incision is made, under local anæsthesia, in the lateral aspect of the toe—as shown in Fig. 1. The upper lateral angle of this incision should come to within not less than one-quarter of an inch of the border of the nail, being careful to leave sufficient room in the healthy tissue for the insertion of a suture. The incision is carried down to the periosteum, and a diamond-shaped piece of tissue excised. Three fine sutures, preferably of fine silkworm gut, are used



Anger's operation.



Cotting's operation.



Von Bergmann's operation.

to close the wound, the middle one being placed so as to coapt the lateral angles of the diamond. This draws the overlapping exuberant granulation tissue away from the nail, as shown in Fig. 3. At times, however, to expedite the retraction of this tissue, it is advisable to make a slight nick near the root of nail as shown in Fig. 3. What we should expect, and what is

FIG. 1.

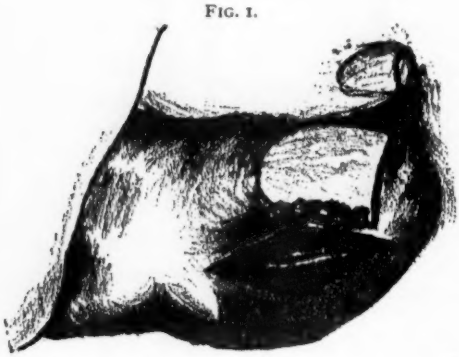


FIG. 2.

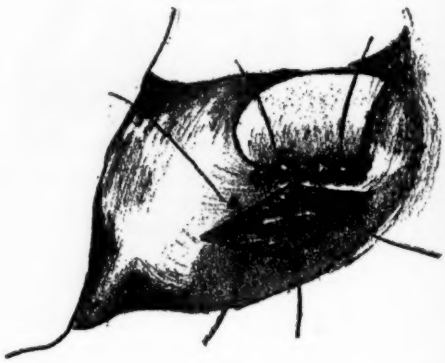
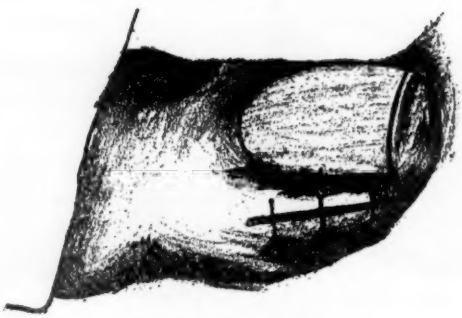


FIG. 3.



Van Meter's operation.

really accomplished by this operation, is the healing of the wound by first intention, having been made entirely in healthy tissue, causing a flattening of the lateral aspect of the toe, and not only effects a cure, but prevents a recurrence of the trouble. No portion of the nail is removed; it is not mutilating; the convalescence is short, and the end result most satisfactory.

THE TREATMENT OF GONORRHŒAL ARTHRITIS WITH VACCINES MADE FROM THE GONOCOCCUS.*

A REVIEW OF FIFTY-ONE CASES.

BY H. F. HARTWELL, M.D.,

OF BOSTON, MASS.

(From the Pathological Laboratory of the Massachusetts General Hospital.)

STIMULATED by the visit of Sir A. E. Wright to this country in the fall of 1906, a number of cases of gonorrhœal arthritis at the Massachusetts General Hospital during the last two years have been treated with vaccines made from the gonococcus. The total number treated is larger than those here reported, but these have been selected because the diagnosis, according to the accepted clinical standards, seemed sure, and because they have all been seen a sufficiently long time afterwards to form an opinion of the permanency of the results.

It happens that all of these cases were males. In all there was a recent or an old urethral infection. In many there had been numerous attacks, which had left lesions in urethra, prostate, or testicles. Some had suffered other attacks of arthritis which had left crippling joints in their train. They all received local treatment for their urethritis. In some of the obstinate cases this was continued till subsequent cultures of washings from the deep urethra after massage of prostate and vesicles showed the absence of gonococci. We have not been able to note any effect on the urethral discharge by the use of these vaccines, though, of course, this was obscured by the thorough local treatment which was pursued at the same time. In some few cases, however, in which urethral treatment was withheld for one reason or another, while vaccines were being given for joint affections, no improvement in the urethral discharge was observed.

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* Read in abstract before the American Urological Association, June 7, 1909.

The vaccines were made from 24-hour cultures, grown on hydrocele agar slants. From these an emulsion of the gonococcus was prepared by washing off the surface growth with normal salt. This emulsion was killed at 60° C. for an hour, or by allowing it to stand in the ice-box over night, and then exposing it to lysol (1:400) for 12 hours. The number of gonococci in the emulsion was determined by counting, and vaccines were prepared in strengths varying from 100,000,000 to 600,000,000 organisms per c.c. No striking difference was noted between the results with the heated vaccines and those in which no heat was used. When possible, all cases were treated with vaccines made from the patient's own urethra or joint, an autogenous, or else with another strain which had shown good results, a stock vaccine.

Treatment in these cases was begun with a small inoculation, the amount being gradually increased to overcome the tolerance established. The acute were inoculated oftener and in smaller amounts than the chronic. In the former, an initial inoculation was from 10,000,000 to 25,000,000, and as progression was made, rarely exceeded 100,000,000. The vaccines were given at intervals of 2 to 4 days. In the chronic the interval varied from 5 days to a week, and the amount often was pushed up to 500,000,000 or 600,000,000. Occasionally toxic symptoms, such as headache, with nausea and vomiting, followed, but they quickly subsided, and produced no serious results.

In most of the cases an attempt was made to grow the gonococcus from the urethra, and in a few from the joints. The results of the bacteriological examinations follow:

	Positive	Negative	Total
Gonococci grown from urethra.....	21	30	51

Gonococci grown from joints:

	Knee	Ankle	Elbow	Wrist	Total
Positive	1	0	1	0	2
Negative	2	1	1	1	5
Total					7

From the urethra cultures usually showed a mixed growth of gonococcus and staphylococcus. From the joints both posi-

tive cases showed a pure culture, while the negative cases gave no growth.

Cole has shown in an analysis of a series from the Johns Hopkins Hospital similar in size to this, that gonorrhœal arthritis is polyarticular, and our cases well illustrate this fact. In 44, or 86 per cent., the infection was multiple at the time of observation, or a multiple involvement was shown in the history. Many which were monarticular at the time of examination gave a history of early mild infection in other joints.

From our observations in the employment of vaccines in these cases, it does not seem that much immunity was obtained by the first few inoculations. In several which were seen early, joints apparently previously uninvolved became acutely inflamed when already 3 to 5 inoculations had been given. It may, of course, be possible that this was caused by too large an inoculation, yet none of these patients exhibited toxic symptoms from their vaccines. It seems more reasonable, however, to look upon it as the clinical course of the gonorrhœal infection, where not enough immunity has been established by the inoculations to overcome a fresh invasion of the micro-organisms.

The following case is cited as an example:

A young man was seen June 22. His first attack of gonorrhœa came on twelve days before, and his right wrist had been painful for five days. Examination showed the wrist swollen, the swelling extending along the radial flexor tendons. Motions of the wrist were painful and limited by spasm. The fingers moved freely. There was a purulent urethral discharge. The wrist was fixed with a splint, and 25 mil. stock vaccine given.

June 24: There was less swelling and tenderness, and the wrist motions were comparatively free without spasm. 50 mil. stock vaccine.

June 29: No pain in wrist, swelling the same. His right shoulder became lame the day before. Given 50 mil. autogenous vaccine grown from the urethral discharge.

July 1: The right shoulder was normal. 60 mil. autogenous.

He did not come for treatment again till July 9. He said he began to have severe pain in his left shoulder six days before,

which continued till yesterday. An examination showed tenderness about the joint, especially over the bicipital groove, and there was marked muscle spasm. The right wrist and fingers could be moved freely. No toxic symptoms had been shown after any of the inoculations. The left shoulder was confined with a sling, and he was given 60 mil. autogenous. He did not report again.

It is certain that no lasting immunity is conferred by the vaccines. Six of our patients had a recurrence of their joint infections at varying intervals after they had been discharged. In 5, the reinfection resulted from a fresh gonorrhœa, while in one, no evidence of a fresh attack could be obtained. The interval from discharge to reinfection in these cases was as follows:

	Cases.
3 months after cure	1
4 months after cure	2
5 months after cure	1
1 year after cure	1
1 year and 5 months after cure	1
Total	6

The question of the comparative value of autogenous and stock vaccines is of practical importance. The production of an autogenous vaccine requires the facilities of a laboratory, and even then, in many cases, it is as futile to grow the gonococcus from the urethra as from many of the infected joints. Torrey, Wasserman, and others working with the gonococcus, have found variation in different strains, both in cultural characteristics and in toxicity for animals. The specificity of immune substances would lead us to expect better results following the use of autogenous vaccines and our clinical experience in this series of cases seems to support this view.

Some of our earlier cases which were begun with stock vaccines, afterwards had autogenous, and we were impressed with the greater efficiency of the latter. Since these earlier cases, autogenous vaccines have always been used whenever the gonococcus could be obtained in culture. One can, however, be easily misled in interpreting the results in these cases. Gonorrhœal arthritis shows a variable clinical course, and it

not infrequently happens that an acute joint suddenly becomes quiescent, the phenomenon taking place with a rapidity comparable to the crisis of pneumonia. The rapid amelioration in symptoms which has followed the inoculation of autogenous vaccine, must be accepted, therefore, with some reserve.

The following case is one in which stock vaccine was first used, followed by autogenous:

Man, 25 years, admitted to the Massachusetts General Hospital March 6. He had gonorrhœa two years before, when the left ankle swelled, and he was disabled for one month. He first noticed the fresh urethral discharge one week ago, and the following day had a cutting pain in the right hip. Examination showed tenderness without swelling or redness at the right sacro-iliac joint, the motions of the right thigh caused pain referred to this region and to the hip. There was slight swelling, redness and tenderness across the left instep, but motions of the ankle were free.

March 8: Given 25 mil. stock vaccine.

March 14: Still had pain in right hip. 50 mil. stock.

March 19: Pain started in left hip three days ago, and he has been steadily growing worse. He lay with the left thigh flexed. The least motion of the left hip caused intense pain and was guarded by muscle spasm. There was marked tenderness with some swelling over the left groin. The right hip was comfortable, and he was able to move it fairly well. 25 mil. stock.

March 24: The left hip was still held flexed. It was less painful while at rest, but any attempt at motion caused pain, and was attended by muscle spasm. 25 mil. autogenous.

When seen the next day, he lay in bed with the left thigh completely extended. There was no pain, and the hip-joint allowed full motion without spasm. His further course was uneventful. April 1 he was walking about the ward with only slight stiffness, and he was discharged on April 9, with full motion in all his affected joints. He had received three more inoculations.

The following case received only autogenous vaccine:

H., 25 years. Was seen as an out-patient, May 13. His first attack of gonorrhœa was two months ago, and three weeks after this he said he had pains in both knees and the fingers of the left hand. These joints subsided in about a week, and at the end

of this time, five weeks ago, the left hip became painful. On examination the hip showed passive motion in flexion to a right angle, with 25° permanent flexion. It was held firmly at a right angle, and allowed no rotation nor abduction. There was one-half inch atrophy of the left thigh and one-quarter inch atrophy of the left calf.

The gonococcus was grown from the urethra. Between May 9 and May 23 he received four inoculations of a vaccine made from this strain, and improved continuously. May 26 there was absolute freedom of motion in the hip, and he walked without limp. November 23 word was received from him that his joint continued in perfect condition.

If we compare the results obtained in the cases treated with autogenous, and those in which stock vaccines were used, we find more evidence in favor of the autogenous. Joints which, after treatment, were capable of complete and full motion without any thickening or adhesions, or without enough thickening to impede their full functionating power, have been classed as "good." Those in which motion was impaired either by adhesions or thickening, have been called "poor." The results in this series were as follows:

	Good	Poor	Total
Cases treated with autogenous.....	19	2	21
Cases treated with stock	23	7	30

A further study of these 51 cases showed that 20 of them were seen within a few days of the onset of their joint symptoms. The remaining 31 had all been through an acute attack before they came under observation, and had been left with disabled joints.

Of the cases seen at the beginning of their attack, 11 were simple hydrops, and all were polyarticular except one. The vaccines diminished their pain and hastened their resolution. Some received massage as soon as the acuteness of the joints allowed. Leaving out those joints which had been disabled from previous attacks, there were only three of these patients who did not recover with perfect results. One of them, when first seen, had an acute infection of the hip, knee, and both thumbs. They all cleared up except the right thumb, which

suppurated, and became ankylosed. The second had been through two previous joint infections, which had disabled both knees and one hip. The third attack involved all the larger joints of the extremities except the shoulders and elbows. He was left with a permanently flexed and disabled right hip, with the other joints the same as before. This patient was so piteously crippled and helpless that he could not be moved to the Zander machines for passive motion. The third had an infection of the shoulder, wrist, and fingers, and had two stiff knuckles when discharged.

The following are examples of these acute polyarticular cases:

A negro, 22 years old, was admitted to the wards February 29. He had been suffering for two weeks with pains in his joints, and was confined to bed. Both wrists, both knees, and both ankles were swollen, tender, and painful on motion. There was fluid in the left knee, and a purulent urethral discharge. He received salicylates till March 5 without improvement. March 6 to March 23 he was given seven inoculations of autogenous vaccine, when he was discharged to his home. There was a rapid improvement and disappearance of pain. Twelve days after the first inoculation he was able to walk about the ward. At the time of discharge all the joints were normal except for a little fluid in the left knee, and slight limitation of motion in the left wrist. He came to the Out-Patient, and received four further inoculations, and by April 18 these two joints had cleared up. He reported nine months afterwards with his joints in normal condition.

Man, 23 years, first seen on May 13. Two and one-half years before there had been a multiple gonorrhœal arthritis, and a few months later another attack. He was laid up from work for ten days, and had stiff wrists and a stiff index finger as a result. His present arthritis had come on five days before. Both ankles, both knees, both wrists, both elbows, and the left sternoclavicular joints were swollen, painful, and tender. There was pain in both shoulders and in the sacro-iliac joints. The fingers and toes were swollen. There was fluid in both knee-joints. The urethra showed a purulent discharge. He was helpless and bedridden. Inoculations of an autogenous vaccine were begun on May 19. There was a steady improvement in the acute symptoms and a

gradual subsidence of the swelling. June 8 he was able to go about on crutches, but the joints were weak and the ligaments relaxed. He received daily massage, and June 24 could walk without any support. He left the hospital on July 3, and spent the summer in the country, gradually becoming more active. He continued to receive inoculations at intervals of a week to ten days. September 28 he resumed work. All his joints except the wrists and index finger, which had been stiff from his previous attacks, were normal. He had gained 12 pounds. He reported five months later, and was in the same excellent condition.

In nine of the acute cases, the process in the joints had become purulent or seropurulent, with infiltration of the periarticular structures. They were all monarticular. This is the type which seeks surgical care. Six of these cases recovered with joints which were capable of complete and free motion. In two of them, which were both suppurations in the knee-joint, some slight thickening remained as late as 5 months after their discharge, but this offered no obstacle to joint function. With the exception of aspiration, which was done for therapeutic as well as diagnostic purposes, these cases had no operative treatment. As emphasized by Cole, we place great importance on early motion in these joints. Fixation is continued only while pain lasts. Just as soon as the acute symptoms have subsided, they have been placed under the care of Dr. C. H. Bucholz for massage and passive motion, and we assign a large share in the final outcome to this treatment. The vaccines have been kept up while the sluggish induration was being absorbed, although it does not seem that they were very efficient in this stage, and thereby the period of their administration has been much prolonged.

Three of these 9 cases had more or less joint disability after their discharge. One was a suppuration of the elbow, in which there was one-third of the normal arc of motion, with periosteal thickening. Both the other two were wrist-joint infections, one of which became completely stiff, and the other had only about one-half of its normal motion. Vaccines seemed to have no effect on the pain and swelling in these two cases. Œdema in these wrist-joints was so marked that we

have thought it must be a determining factor in these poor results. With tissues so swollen, especially in a joint with so many small synovial partitions, there must be considerable resistance offered to the blood stream, and antibodies could not be brought in sufficient abundance to the inflammatory foci. Guided by this theoretical explanation, we have employed active hyperæmia produced by hot air to stimulate the congestion and carry off the œdema from the tissues. With two later cases of wrist-joint infection which were given daily hot air baking, the œdema was reduced, the pain was relieved, and they both had perfect results.

The following cases are examples of suppurating joints:

A. P., 35 years, admitted May 29. Ten weeks before he first noticed a urethral discharge, and eight weeks later, following a chill, the right knee became sore. It was very painful and the swelling had increased. Examination showed the right knee swollen and the capsule tensely distended with fluid. The joint was held flexed at an angle of 45 degrees and no motion was possible. There was a slight rise in temperature, ranging from 100° to 102° and very slight urethral discharge. About 50 c.c. of purulent fluid was removed from the joint at two successive aspirations, which showed gonococci in the smears and in culture. Inoculations of his own vaccine were begun June 3, and on June 16 the acute symptoms had quieted down to permit of light massage. He was discharged from the ward on July 2 with 45 degrees of motion, and came to the out-patient for vaccines and Zander treatment. July 31 he could completely extend his knee and went back to his work. He reported November 14, when the knee allowed free and full motion without fluid. There was a slight amount of periarticular thickening, the circumference over the patella being 2½ cm. more than over the left.

H. B., 28 years, admitted July 11. He had three attacks of gonorrhœa, the last six weeks ago. He first had pain in his left elbow thirteen days ago. Swelling soon appeared, and had rapidly increased. There was no urethral discharge, and examination showed the left elbow flexed at about 40 degrees. It was red, swollen, and tender. The capsule on either side of the olecranon was bulging, and but a few degrees of motion were possible. Swelling extended down the forearm to the dorsum

of the hand. About 5 c.c. of purulent fluid was obtained from the joint by aspiration, which showed a pure culture of gonococcus. July 15 an autogenous vaccine was begun. There was improvement, and he was discharged from the wards July 19. Vaccines were continued in the out-patient department, and he was given passive motion on the Zander machines. Treatment was suspended August 31, when there was complete extension of the elbow, nearly complete flexion, with slight limitation in pronation and supination. He reported November 11, and had increased the joint motion so that there was full flexion and extension. There was very slight limitation in pronation, which was accompanied by crepitus. Muscle atrophy was still marked.

Thirty-one, or more than half of our cases, were seen when the acute inflammation had subsided. They came for treatment at periods ranging from one month to a year after their acute attacks. They all had the typical indolent crippling lesions which are the sequelæ of this distressing affection. The joints were swollen, either from periarticular infiltration, intra-articular fluid, or œdema, and had shown little progress. They were stiff, and painful when used. The majority were so disabled that they could not work, especially those in whom the joints of the lower extremity were affected. In 27 of these cases the result of treatment was successful, and they were discharged with complete functionating joints without disability. They have all reported at intervals of a month to a year after their discharge, and in all the perfect joint function has been maintained. In many, the contrast in their physical condition at the time of last reporting and when they first began treatment was striking. The resumption of function in the joints had allowed them to exercise, they had put on weight, and had a rugged healthy appearance. In some in whom disability was slight, the length of treatment was shorter than in the acute cases. In others, with more marked and long-standing changes, it was much more protracted. Infection of the ankles and small joints of the feet was very obstinate. Many of these cases had everted ankles, and the constant strain of walking kept up the irritation. In some of them a successful result was only attained by manipulative correction

with rest in bed. The tender areas at the plantar surface of the os calcis, painful heals or talalgia, which were often seen in these cases, was another obstinate lesion. In all it eventually disappeared without recourse to operation. In no one of these cases, however, was a bone spur demonstrated by X-ray.

In 4 of these patients with chronic joints, the result of treatment was not satisfactory. Two were chronic infections of the ankle-joints, one dating back 12 years, another 6 years. They were treated during an exacerbation without effect on the pain or the deformity. Two with multiple joints, improved considerably, but they were both discharged with stiff shoulders.

Among these chronic cases there were 5 with stiff backs. In all except one there was, or had been, involvement of other joints as well. In 4 cases the stiffness had existed for a year or more, while in one, it was of three months' duration. In all of them motions were limited throughout the whole spine, and in any attempt at forward bending it moved as though fused. There was no deformity. There was pain in the lower dorsal and lumbar region, but it was not referred to the anterior aspect of the body. It often interfered with sleep. In one, the X-ray showed thickening about the lower dorsal and upper lumbar vertebræ. Improvement in all these cases was very striking. While they did not recover the complete freedom of motion of a normal back the spinal motions in all were very much increased and were free enough to give them no inconvenience in their work. They were entirely relieved of their pain.

From observation of these cases it would seem that gonococcus vaccines are a valuable therapeutic agent in gonorrhœal arthritis, in all stages of the inflammation except where ankylosis has occurred. They do not, however, seem to be able to prevent extension to fresh joints in early cases, and certainly do not produce enough lasting immunity to prevent recurrence of arthritis. Autogenous vaccines seem to be more efficient than stock, thus corresponding to the known specificity of biological substances.

BOOK REVIEWS.

OPERATIVE MIDWIFERY. By J. M. MUNRO KERR, C.B., C.M., Glas., Fellow of the Faculty of Physicians and Surgeons, Glasgow; Obstetric Physician, Glasgow Maternity Hospital. With 294 illustrations in the text. 8vo, pp. 705. New York, William Wood & Co., 1908.

Since the modern operations of Cæsarean section, vaginal hysterectomy, pubiotomy, symphysiotomy, and abdominal section for extra-uterine pregnancy, tumors, and similar intra-abdominal complications of pregnancy have been evolved and are so often performed in suitable cases by all well-prepared obstetricians, obstetrics has become essentially a part of surgery and the accoucheur to be successful requires a thorough surgical training.

Many years have elapsed since a treatise devoted entirely to operative midwifery has appeared in the English language. The recent volume by Kerr supplies such a want. The work is devoted entirely to the consideration of the indications of the various operative procedures now practiced in obstetrics, and a detailed description is given of the technic of operation involved in each.

Fully one-half of the volume is devoted to the subject of dystocia, and in the subdivisions of this general subject separate chapters are devoted to the consideration of the various conditions giving rise to difficult labor. The causes inherent in the forces of labor, in the birth canal or in the child itself, are systematically considered, and the different abnormalities of presentation, malformation of the child or pathologic changes in the maternal organs are clearly described and, so far as it is possible to do so, are illustrated by excellent plates, many of them made directly from material in the possession of the author.

The obstetric operations—version, forceps, symphysiotomy, accouchement forcé, vaginal Cæsarean section, and the different operations involving destruction of the child—are described in detail in separate chapters. Such pathologic conditions as moles, extra-uterine pregnancy, placenta previa, and the various varieties of hemorrhage form another group of interesting chapters, and,

finally, the various accidents occurring to either mother or child at the time of birth are carefully considered.

Few medical men are called upon to conduct a case of labor in which the product consists of a double monster, and even obstetricians of considerable experience will see in a life-time but two or three confinements so complicated; nevertheless, a practitioner may any day find himself face to face with such an obstetrical emergency, and it is therefore necessary for him to know what has been the usual history of such cases and in what way the difficulty in delivery can best be overcome. The chapter devoted to double monsters has been written by J. W. Ballantyne of Edinburgh, and is an excellent summary of our knowledge of this unusual condition.

One of the most important chapters in the book is devoted to the diagnosis of presentation by means of abdominal manipulations, and as this subject has been imperfectly considered in medical literature, the directions given are of unusual practical value.

As a literary contribution, the book is well worth reading, and the judicial manner in which the author marshals his facts and conclusions gives more than ordinary force to his teaching. He is eminently conservative. "A first labor is a trial labor; so with moderate pelvic deformity it is well to have recourse to any major operation only if nature fails after she has been given a long trial." This sentence may be taken as the text upon which the book is developed, and it would be well if all men called to attend women in labor would adopt the same conservative attitude. Few books that have appeared in medicine can be read with more pleasure and profit. The illustrations are new and excellent, and altogether the volume forms one of the most important additions to the literature of obstetrics that has ever appeared.

HENRY P. DE FOREST.

MANUAL OF OPERATIVE SURGERY. By JOHN FAIRBAIRN BINNIE, A.M., C.M., Professor of Surgery in the Kansas State University, etc. Fourth edition. Volume I. Philadelphia, P. Blakiston, Son & Co., 1909.

This book of Dr. Binnie's is rapidly outgrowing the limits which it set for itself at the beginning. In this fourth edition it has become a two-volume work, and this first volume considerably exceeds in its number of pages the entire original work,

although an attempt is still made to keep down its size to the requirements of an overcoat-pocket edition. One edition has followed another rapidly and this has testified to the popularity which the book has enjoyed; a popularity due somewhat to its convenience of size and attractiveness of typography, but more particularly to the fact that in it the reader has been able to find the latest things in surgical operative work, while the well-established and classical surgical procedures with which the ordinary books of operative surgery are concerned are omitted. In addition to this, however, that which has commended it doubtless to the majority of readers has been the practical nature of its contents as transmuted, by the experience and common sense of a most practical surgeon, from the literature of the subject. How difficult it has been, in the fecundity of operative surgery at the present time, to keep a book which attempts in any fair degree to present its advances, is well exemplified by the constant growth of this book. There is no opportunity for criticism as to the manner in which the author has carried out his scheme; it is altogether a useful and commendable work.

SURGERY OF THE UPPER ABDOMEN. By JOHN B. DEAVER, M.D., Surgeon-in-Chief to the German Hospital, and A. P. C. ASHHURST, M.D., Surgeon to the Out-Patient Department, Episcopal Hospital. In two volumes. Volume I, pp. 468, 76 illustrations. P. Blakiston's Son & Co., Philadelphia, 1909.

The first instalment of this work on the Surgery of the Upper Abdomen is devoted to the surgical lesions of the stomach and duodenum. The liver and bile passages, the pancreas, and the spleen, are to be considered in the second volume, the date of publication of which is not announced.

The general subject has been taken up in a broad and comprehensive way, the first fifty-five pages being devoted to the anatomy and embryology of the parts concerned, and to the physiology of digestion. The latest views on these matters are well summarized. The anatomical cuts would have been more useful to the average reader if references by line or letter to the different structures or organs had been added. The applied physiology is largely a résumé of the work of Cannon, Blake, and Murphy (published in the *American Journal of Medical Sciences,* and the ANNALS OF SURGERY, in 1905, '06, and '07). It is well done, and is both clear and readable.

The chapter on General Diagnostic Considerations might with advantage have included wider application of the anatomical and physiological facts previously described, but no other fault can be found with it. Particularly to be commended is the opening page on which the authors object to that conception of the surgeon's function—in intractable cases of disease of the upper abdomen—which, as they say, "is colloquially referred to as 'taking off the lid.'" We believe, as they seem to believe, that the expression might be regarded as an index to the surgical tone of the man to whom it applies. Attention might here have appropriately been called to the frequency with which abdominal symptoms,—rigidity, distention, etc.—are associated with supradiaphragmatic lesions although the abdomen and its contents are not directly involved. This has been a fruitful source of error and deserves emphasis.

The chapter on Benign Diseases of the Stomach and Duodenum is excellent. The differing claims of the internists and the operators are set forth and the evidence weighed with reasonable fairness. In the chapter on Gastric Ulcer the authors summarize their views (apparently but not unmistakably referring to benign diseases generally) as follows:

"Surgical treatment allows 95 to 98 per cent. of these patients to recover. Medical treatment allows 75 to 80 per cent. to recover. Surgery permanently cures practically every patient who recovers. Medicine permanently cures only 30 to 40 per cent. of its patients. Medical treatment is long and uncertain. Surgical treatment is rapid and sure." This is possibly a little extravagant, but they add that they have no desire to be understood as urging surgical intervention in every case of gastric ulcer, and continue: "Medical treatment should always first be tried, and only when methodical and energetic medical treatment has failed to cure the patient, after it has been persisted in for a reasonable time, or when several temporary cures have resulted in ultimate relapses, only then, we repeat, is surgical treatment to be considered in patients with acute, actively ulcerating lesions. In ulcers such as these, it is mainly on account of the complication of hemorrhage that the surgeon's advice is sought. Perforation is universally acknowledged to call for surgical intervention at the earliest possible moment. But in regard to hemorrhage there is still dispute."

As to the choice of operation in gastric perforation, although the facts now before the profession cannot be said to justify the final formulation of rules, we believe, with them, that at present in any case where it is not specifically and positively contraindicated, gastrojejunostomy should be performed.

Pylorospasm is accurately described as "only a symptom of some other malady," and the somewhat analogous condition of infantile stenosis of the pylorus is likewise regarded as a muscular hypertrophy brought about by persistent spasm due to irritation from some cause, such as hyperacidity of the gastric juice, or a small erosion or fissure.

The need for distinguishing the vomiting caused by acute dilatation of the stomach, when post-operative, from that due to the anæsthetic and from the vomiting of peritonitis, is emphasized and the conditions differentiated. Secondary gastric dilatation is assigned in the great majority of cases to obstructive causes, and the safe prediction is made that the so-called "atonic" cases will grow rarer—just as vesical "atony" has almost vanished—as the surgeon is given more opportunities to find the underlying cause of the condition.

Syphilis of the Stomach is considered in three pages. The fact is not noted that in nearly every case of so-called gastric syphilis that has been reliably reported there have been associated lesions—often gummata—of the liver. Many of the stomach conditions found may well have been secondary to the hepatic disease. There are some recent exceptions to this general statement but, for other reasons, most of them are unconvincing as to the specific character of the gastric lesions described.

Carcinoma of the Stomach is very fully and satisfactorily dealt with. There can be no dissent from the assertion that "the presence of cancer should be suspected when chronic gastric catarrh exists without any discoverable cause (such as abuse of food, of alcohol, of drugs; circulatory disturbances of the heart or liver; or diseases, such as gall stones, gastric ulcer, etc., which would cause some definite lesions in the region of the stomach), especially if this chronic gastritis be in a patient over forty years of age, and if it be attended by loss of appetite for meats (Kocher)."

It is also true that if a tumor exists the diagnosis is less difficult,—so many diseased conditions not associated with swelling or new growth being then eliminated. But that the characteristic

pyramidal shape of a pyloric growth can *frequently* be recognized we take the liberty of doubting, in spite of the authority of Kocher. We agree with the further statement that "occult blood in the stomach contents and fæces is the most valuable of the laboratory findings. In non-malignant ulcerations of the stomach, rest in bed with milk diet will cause the disappearance of occult blood. In cancer no treatment has any effect."

The practitioner to-day has, perhaps, no more difficult decision to make than in doubtful cases of this character at a relatively early stage. That decision will necessarily, for some time to come, depend not merely on the lapse of time or—in the absence of tumor—upon the persistence of catarrh, in spite of diet and medical treatment, but also upon the temperament of the physician, his previous experience with surgery—and surgeons—and his willingness to share responsibility for an operation which may prove to be only diagnostic—and that negatively. To say that "it seems to us that every case diagnosticated *certainly* as carcinoma of the stomach before operation is a disgrace to the attending physician, provided he has had the patient under treatment for more than a few weeks" seems a little intemperate in expression, while the context shows the very vagueness—due to the imperfection of our knowledge—that is the cause of the delays of which the authors complain. They speak of "that space of time"—referring to "a few weeks"—as if it were a definite period, and contend that within it the conclusion should be reached that an "anatomical basis" for the symptoms exists and—a non sequitur—that this can be removed only by operative means.

These remarks are merely in palliation and not in support of delay. With the general contention of the authors we are entirely in sympathy, and as for some time to come errors in one direction or the other will be unavoidable, we believe that it will be better for the patients if they are in the direction of hastening rather than postponing surgical intervention.

In Stab-wounds of the Abdomen, when the absence of protrusion of the omentum or escape of abdominal contents renders the existence of penetration of the abdominal cavity uncertain, they wisely advise that the surgeon make a layer-by-layer dissection, arrested at first at the aponeurotic and then at the peritoneal plane of the abdominal wall and they add: "We are thus insistent upon this cautious approach, and upon determining beforehand

whether the peritoneal cavity has been penetrated by the weapon, because it often happens that on opening the abdomen widely in these cases inspection shows no evidence of intra-abdominal lesion. and very extensive search becomes necessary to exclude the possibility of visceral injury; and if none be found to exist, and it is shown that the vulnerating weapon itself had never opened the peritoneal cavity, the surgeon will have subjected his patient to a quite unnecessary and by no means trivial operation. If, however, the fact of abdominal penetration has been definitely determined in doubtful cases by the method just described, the surgeon will be quite justified in his extensive intra-abdominal manipulations, even though no lesion be found more serious than hemorrhage from an omental vein."

In Gunshot Wounds of the Stomach early operation in civil life, and non-interference in military practice, are advocated, statistics demonstrating the correctness of both positions.

The chapters on the Technique of Operations while necessarily excluding many procedures still employed, represent on the whole the best methods of to-day, and are as well adapted to enlighten the intending operator as any with which we are familiar.

The statistical matter throughout is most useful and informing. Every effort has obviously been made to bring it up to date, as is exemplified by the reference (page 287) to the figures of Mikulicz (1901), Hahn (1898), and others, as "rather ancient."

The illustrations as a rule are excellent. The legends err on the side of brevity. We do not like to see adhesions involving the sigmoid flexure described as "perigastric," even though the underlying cause is thereby indicated.

The book is well written. We were inclined to criticize a sentence which speaks of a summary "as illustrative of the interrelation which unites the digestive processes in an orderly series of successively dependent events," but found that Cannon was responsible for it and not the authors. We see no reason why an American should write "endeavour" or "candour," or why any one should write "develope" and "developement." Certainly no one should write: "its greater liability to fatal hemorrhage and to perforation make a sudden death probable" (page 205); and the grammar of "the chief artery met with in the upper abdominal wall is the internal mammary or some of its terminal

branches" (page 2) is scarcely better. We rather like the word "puked" (page 154) though its use has come to savor of literary affectation. Postempski is entitled to have his name spelled either without a "p" (page 267), or with a "p" (page 263), and not in both ways.

In the index—which is well-made—*im*perforation of the œsophagus refers to page 179 and not to page 129, where perforation is mentioned.

But all these criticisms are trivial. The book is a notable contribution to one of the most important departments of modern surgery, and reflects credit upon both the industry and the intelligence of its authors and—in its physical characteristics—upon its publishers.

J. William White.

CORRESPONDENCE.

TORSION OF SPERMATIC CORD.

Editor Annals of Surgery:

The present report of a single case is submitted on account of its rarity, as an addition to the literature of the subject.

A man, aged thirty-two, noticed a swelling in the left inguinal region October 10, 1908. As a boy he had developed a hernia of which he was apparently cured by truss pressure. During the past ten years, however, he had at times noticed a swelling in the inguinal region. When he again noticed this swelling, at the last date mentioned, he applied a truss after having apparently reduced the swelling, and was able to attend to his usual occupation for the day, suffering no inconvenience; but about midnight, after retiring, he began to suffer pain in the inguinal region and again noticed the swelling. This pain persisted and became very acute with increase of the swelling, and when I saw him, forty-eight hours after, he was suffering intense agony. On examination there was found a tense, painful swelling extending from the external inguinal ring to the bottom of the scrotum; he also had severe abdominal pain. He was nauseated, and vomited during the day, but his bowels had moved normally. His temperature

was 100°; pulse 104. The enlargement was irreducible and exquisitely tender; dull on percussion. An inguinal incision was made as in a Bassini operation for hernia. After the superficial fascia had been incised a mass almost black in color presented itself in the wound. The condition, upon examination, was found to be due to a torsion of the spermatic cord, with necrosis of the testis. The twist in the cord was from left to right, that is, from without inward, and was comparatively easily untwisted. The whole necrotic mass up to the external ring was removed. The usual steps of a Bassini operation, including the splitting of the external oblique muscle, completed the operation. No evidence of a previous hernia was detected. An uninterrupted recovery followed.

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